MERGERS, AGENCY AND MANAGERIAL RESPONSE: AN EMPIRICAL EXAMINATION OF POTENTIAL WEALTH SHIFTS IN SYNERGISTIC AND NON-SYNERGISTIC CORPORATE MERGERS

BY

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MERGERS, AGENCY AND MANAGERIAL RESPONSE: AN EMPIRICAL EXAMINATION OF POTENTIAL WEALTH SHIFTS IN SYNERGISTIC AND NON-SYNERGISTIC CORPORATE MERGERS

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Each year, hundreds of corporations are involved in acquiring other firms, yet recent studies have suggested that while the acquired firm's shareholders typically gain, the acquiring firm's shareholders do not necessarily benefit from such mergers. In fact, it appears that often it is the managers of the acquiring firms who stand to gain the most from mergers and that in the absence of synergies, shareholders actually suffer a loss due to the wealth shift characteristics of mergers. This result, if it is true, contradicts the most basic assumption of finance theory, that managers operate the firm to maximize shareholders wealth. Do managers act in their own best interest at the expense of the shareholders they are paid to represent or do they take actions to offset these potential wealth shifts? Does the existence of synergy allow managers to capture some of the gains for themselves?

This study attempts to act as a link between the academic theory of mergers and actual management practice. Specifically, changes in the capital structure of merging firms are examined to determine whether they are consistent with managements' attempts to neutralize the wealth shifts suggested by option pricing theory or whether they may be explained in terms of general market forces or the terms of the mergers. Further, the effects of synergies are examined to determine whether managers attempt to retain some of the benefits of the gains for themselves.

The results of the study support the hypothesis that managers attempt to neutralize potential wealth shifts by altering the capital structure of the firm. The study also provides evidence that mergers which generate synergy are systematically different from those which create no additional value. However, there is not consistent evidence that managers are pursuing personal goals at the expense of their shareholders. The results suggest that the capital structure changes of merging firms are insensitive to changes in interest rates and stock market levels but are impacted by the terms of the merger.

CHAPTER 1
INTRODUCTION AND BACKGROUND

Introduction

The topic of corporate mergers and acquisitions has been one of great interest to both business practitioners and academicians during the past several years. The importance of the topic is perhaps best explained by noting the large number of mergers which occur each year (Mergers and Acquisitions, 1968 - 1983). Managing mergers and acquisitions is obviously an important part of corporate management. However, recent studies (Dodd and Ruback, 1977; Langetieg, 1978, and others) have suggested that mergers are not necessarily beneficial to the shareholders of the acquiring firms. Even though shareholders of the acquired firm have been found to gain most, the managers of the acquiring firms may also stand to gain from mergers and in the absence of synergies, shareholders of the acquiring firm may actually suffer a loss due to the wealth shift characteristics of mergers. This result, if it is true, contradicts the most basic theoretical assumption of finance, that managers operate the firm to maximize shareholders' wealth. Do managers act in their own best interest at the expense of the shareholders they are paid to represent or do they take actions to offset these potential wealth shifts?

Specifically, this study examines the changes in capital structure which have been observed (Kim and McConnell, 1977) to occur during mergers to determine whether these changes are consistent with the neutralization of wealth shifts or simply due to the terms of the

merger or other market characteristics at the time of the mergers. Further, the role of synergies in this process is examined to determine whether managers take actions to capture a share of the available gains. A model is formulated to test two central hypotheses: first, that managers take actions, during mergers, consistent with the maximization of shareholders' wealth and the neutralization of potential wealth shifts and, second, that the existence of synergies results in less neutralizing actions by the managers. The central hypotheses are tested against two alternate hypotheses which suggest that changes in leverage may be explained by market forces or the terms of the merger.

This dissertation is composed of seven chapters. This chapter introduces the goals of the study and outlines the underlying models which will be used in the construction of empirical tests. Chapter 2 provides a review of the existing literature on this topic. Chapter 3 outlines the specific tests and explains how the data were collected. Chapter 4 provides a detailed examination of the actual sample collected. Chapter 5 reports the results of the first series of tests without controlling for synergistic effects. Chapter 6 reports the results of the tests when synergies are controlled and also discusses empirical and theoretical problems with synergy measurement. Chapter 7 provides a summary and conclusion. Appendices following the final chapter discuss related test results and provide information about the data.

Background

It has been argued by Levy and Sarnat (1970) that the diversification effect of mergers does not create value. That is, in the absence of synergies, value additivity holds and the post-merger value of the firm is simply the sum of the values of the combining parts. However, Galai and Masulis (1976) and Lam and Boudreaux (1984) have shown that the change in the variance of asset returns resulting from the merger may alter the relative positions of bondholders and stockholders. Since the combination of two risky assets, or firms, tends, to reduce total variance, the wealth transfer will, in general, be from stockholders to bondholders.

The basic relationships can best be illustrated by a simplistic numerical example. Consider two firms, A and B, both of which have risky debt in their capital structures and which will merge and become firm A^*. For simplicity, these firms are assumed to exist in a single period world where the face value of debt is payable at the end of the period. Table 1-1 shows the required information for two unrelated firms prior to their merger. Black and Scholes (1973) have shown that their option pricing model can be used to value the equity of the firm. The equity can be considered as a call option on the assets of the firm. At the time the debt matures, the stockholders may choose to exercise their option by paying off the debt and retaining the assets of the firm or let the option expire and forfeit the assets to the debtholders. Using the values for firm A in the numerical example, the value of firm A's equity can be calculated using the option pricing model as follows:

$$S = VN(d_1) - De^{-r_f T}N(d_2)$$

Table 1-1
Artificial Data for Two Unrelated Firms Prior to Merger

	Firm A	Firm B
Value of the firm	V_A = \$500	V_B = \$700
Face value of outstanding debt	D_A = \$300	D_B = \$500
Variance of total return	σ_A^2 = .30	σ_B^2 = .35
Correlation coefficient between the return streams	ρ_{AB} = .5	
Risk free interest rate	r_f = 8%	

where $d_1 = \ln(V/D) + r_f T / \sigma\sqrt{T} + \frac{1}{2}\sqrt{T}$

$d_2 = d_1 - \sigma\sqrt{T}$

where S = the market value of the equity

V = the market value of the assets

D = the face value of the debt

r_f = the risk free rate of interest

T = time to maturity of the debt

N( ) = the cumulative probabilities for a unit normal variable

Inserting the values for firm A yields the following result.

$$S_A = 500\ N(d_1) - 300\ e^{-.08\ (1.0)}\ N(d_2)$$

$$d_1 = (\ln(500/300) + .08\ (1.0)) / \sqrt{.30} + \tfrac{1}{2}\sqrt{.30}$$

$$d_1 = 1.3525$$

$$N(d_1) = .9115$$

$$d_2 = 1.3525 - .5477$$

$$d_2 = .8048$$

$$N(d_2) = .7881$$

$$S_A = 500(.9115) - 300\ e^{-.08\ (1.0)}\ (.7881)$$

$$= 455.75 - 218.25$$

$$= 237.50$$

As the total value of the firm equals \$500, the market value of the debt must equal \$500 - 237.50 = \$262.50 compared to a face value of \$300. The expected return on the risky debt of firm A may be calculated as follows:

$$r_A = (D_A - B_A) / B_A$$

$$r_A = 300 - 262.50 / 262.50$$

$$= .143 \text{ or } 14.3\%$$

Corresponding values for firm B are inserted in the table.[1]

Now consider the effect of the merger of these two firms where no synergistic gains accrue to the combined firm. Table 1-2 contains the market information for the combined firm and compares it with that of a value weighted portfolio of the two firms without the merger.[2] The value weighted portfolio represents the total value of a portfolio consisting of all outstanding debt and equity of the two firms. The merger results in a decline in variance. The variance of the combined firm is calculated as follows:[3]

$$\sigma_{AB}^2 = W_A^2\sigma_A^2 + W_B^2\sigma_B^2 + 2W_AW_B\sigma_A\sigma_B\rho_{AB}$$

where $W_A = V_A / (V_A + V_B)$

$W_B = V_B / (V_A + V_B)$

Inserting the appropriate values yields the following result.

$$W_A = 500 / (500 + 700) = .417$$

$$W_B = 700 / (500 + 700) = .583$$

$$\sigma_{AB}^2 = (.417)^2.30 + (.583)^2.35 + 2(.417)(.583)(.548)(.592)(.5)$$

$$\sigma_{AB}^2 = .241$$

This new variance, along with other data for the combined firm, can be used to calculate the value of the equity of the combined firm using the option pricing model.[4] The resulting values are inserted in Table 1-2. It can be seen that the debt holders have benefited from the merger while the equity holders have been harmed. Note that

Table 1-2
Artificial Data for the Merged Firm with Comparison to a Value Weighted Portfolio of the Two Unmerged Firms

	Merged Firms	Value Weighted Portfolio	Change
Total value	$1200	$1200	$ 0
Face value of debt	800	800	0
Value of equity	499.90	522.20	(22.30)
Value of debt	700.10	677.80	22.30
Rate of return on debt	14.3%	18.0%	(3.7%)

the expected return on debt has declined from a weighted average return of 17.9% to 14.3% and the total value of debt has increased.

Some authors (Lee, 1977; and Lewellen, 1971) have explained this phenomenon as a co-insurance of debt effect. They note that the combination of two, less than perfectly correlated, cash flows results in a more stable series which reduces the default risk of the debt held by the firm. Thus, in the absence of synergies, the value of the firm's debt should increase, transferring wealth away from the shareholders.

However, these wealth shifts may be partially or completely neutralized by increasing the leverage of the firm and making the debt riskier than it would normally be in the combined firm. There are at least two ways to accomplish this. First, additional debt may be issued and its proceeds used to retire existing equity. This is often accomplished at the time of the merger by using the proceeds from debt to liquidate the interest of the acquired firm's shareholders with a cash purchase. This method neutralizes the wealth shift while leaving the overall value of the firm constant. The second method of neutralizing the wealth shifts involves expansion of the firm financed by debt. This technique typically results in the merged firm issuing additional debt after the merger to move to a new equilibrium capital structure. This method will often be used following a pure exchange merger which results in a wealth shift.

Table 1-3 illustrates each of these techniques and compares the results with the simple combination from Table 1-2.[5] Note that a larger issue of debt is required in the expansion case because of the increase in the total value of the firm. It is also interesting to

Table 1-3
Neutralizing Wealth Shifts

	No Change in Debt	Debt Used to Retire Equity	Debt Used to Expand the Firm
Total value	$1200	$1200	$1502.54
Face value of debt	800	924.20	1157.00
Value of equity			
- Stock value	499.90	416.80	522.20
- Cash value		105.40	
Total value	$499.90	$522.20	$522.20
Value of debt	700.10	783.20	980.34
Increase in debt	0	105.40	302.54
Rate of return on debt	14.3%	18.0%	18.0%

note that the price per share of stock declines in the case where debt is used to retire equity because equity holders receive part of the value of their holdings in cash.

Two additional assumptions are required to obtain the results shown in Table 1-3. First, it is assumed that there are no bond covenants which prevent additional debt from being issued without subordination. Secondly, in the expansion case, it is assumed that available projects are efficiently priced and that their net present value equals zero.

If perfect bond covenants exist which allow only subordinated debt to be issued, the wealth shift to the original bondholders will not be offset. It is not the purpose of this study to examine the degree to which the original bondholders are protected by such covenants but casual examination of actual mergers suggests that a large portion of debt issued during mergers is not subordinated. If projects with positive net present value are available, the new equilibrium will be attained with less expansion.

It is important to note that in a non-synergistic corporate merger of the type illustrated, the shareholders lose value unless management issues more debt to neutralize the potential wealth shift. Remember, the merger creates no value itself because there was no synergy. Thus, a gain to one party must be directly offset by a loss to another. However, some mergers result in a net increase in value or synergy. In these cases, it is possible that the positions of both the bond and stockholders can be improved. Table 1-4 shows the results of a merger of the two previously discussed firms when the merger results in $100 of synergy or additional value being created

Table 1-4
Artificial Data for the Merged Firm When Synergies Are Present

	Merged Firm	Value Weighted Portfolio	Change
Total value	$1300.00	$1200.00	$100.00
Face value of debt	800.00	800.00	0.00
Value of equity	590.28	522.20	68.08
Value of debt	709.10	677.80	31.92
Rate of return on debt	12.8%	18.0%	(5.2%)

by the combination. With the presence of synergies, gains by the debtholders do not imply losses by shareholders. However, the shareholders do not retain all synergistic gains but share them with the bondholders, depending on the terms of the exchange.

A manager whose goal is to maximize shareholders wealth will be motivated to increase the leverage of the firm to neutralize these gains by the bondholders. Since this synergistic merger has increased the value of debt above that in the non-synergistic case, a larger amount of new debt will be required to neutralize the gains by bondholders. It is important to note, however, that even if no neutralizing actions are taken, the value of the stockholders claims will increase over their pre-merger position. This phenomenon will occur whenever the value of the synergistic gains exceeds the wealth shift to bondholders.

The preceding examples have illustrated the potential for wealth shifts in corporate mergers and lead directly to the central issues examined in this study. A manager whose goal is to maximize shareholders' wealth will be motivated to increase the leverage of the firm to neutralize potential wealth shifts during mergers. However, the existence of synergies may allow the managers to share in the gains from the merger while still maintaining the wealth of the acquiring firms shareholders at a level at least that prior to the merger. The primary means by which managers may gain is through not fully neutralizing the wealth shifts with increases in leverage. Since a large portion of the manager's personal wealth is in the form of human capital, dependent on the firm, the risk to that capital may be reduced by reducing the financial risk of the firm. The central

questions of this study are whether managers act as if they are aware of the wealth shift potential of corporate mergers and take actions consistent with the neutralization of these wealth shifts and what impact do synergies have on this process.

Notes

1. The value of firm B's equity can also be calculated using the option pricing formula of Black and Scholes (1973).

$$S_B = \$700\ N(d_1) - \$500e^{-rf\ T}N(d_2)$$

$$d_1 = (\ln(700 / 500) + .08(1.0)) / \sqrt{.35} + \tfrac{1}{2}\sqrt{.35}(1.0)$$

$$d_1 = 0.9998$$

$$N(d_1) = 0.8413$$

$$d_2 = 0.9998 - 0.5916$$

$$d_2 = 0.4082$$

$$N(d_2) = 0.6591$$

$$S_B = \$700(.8413) - \$500e^{-.08(1.0)}(.6591)$$

$$= \$284.70$$

The market value of debt is \$700 - \$284.70 = \$415.30 versus a face value of \$500. and the expected return on the debt is

$$r_B = (D_B - B_B) / B_B$$

$$= (500 - 415.30) / 415.30$$

$$= .204 \text{ or } 20.4\%$$

2. The value weighted portfolio represents the total value of a portfolio which consists of all outstanding debt and equity of both firms without a merger of those firms.

3. In this example, and throughout the study, variables subscripted AB refer to the combined firm as predicted from the pre-merger component firms while the subscript A^* is used to denote the combined firm as actually exists after the merger.

4. The value of the combined firm's equity can be priced as follows:

$$S_{A^*} = \$1200\ N(d_1) - \$800\ e^{-rfT}N(d_2)$$

$$d_1 = (\ln(1200 / 800) + .08(1.0)) / \sqrt{.241} + \tfrac{1}{2}\sqrt{.241}(1.0)$$

$$d_1 = 1.2344$$

$$N(d_1) = .8907$$

$$d_2 = .7435$$

$$N(d_2) = .7704$$

$$S_A^* = \$1200(.8907) - \$800\, e^{-.08(1.0)}(.7704)$$

$$= \$499.90$$

The value of the combined firm's debt is \$1200 - 499.90 = \$700.10 and the expected return on the debt is

$$r_{A*} = (D_{A*} - B_{A*}) / B_{A*}$$

$$= (800 - 700.10) / 700.10$$

$$= .143 \text{ or } 14.3\%$$

5. To neutralize the wealth shift with no expansion, the value of the equity, after the increase in debt, plus the market value of the debt floated must equal the pre-merger total value of equity. Note that the market value of new debt is included in shareholders' wealth because the proceeds from the new debt are used to retire equity in the no expansion case. Numerically, the following two conditions must be met.

$$S = \$1200\, N(d_1) - (\$800 + F)e^{-.08(1.0)}N(d_2)$$

$$\$522.20 = S + F / (1 + R)$$

where F = the face value or promised amount of new debt issued to retire equity.

$F / (1 + R)$ = the current market value of the new debt.

The solution cannot be solved directly and must be obtained by iteration. In this example, additional debt of \$124.40 satisfies the two equations.

$$S = \$1200\, N(d_1) - (\$800 + \$124.40)e^{-.08(1.0)}N(d_2)$$

$$d_1 = (\ln(1200/924.40) + .08(1.0)) / \sqrt{.241} + \tfrac{1}{2}\sqrt{.241}(1.0)$$

$$d_1 = .94$$

$$N(d_1) = .8264$$

$$d_2 = .94 - \sqrt{.241}(1.0) = .45$$

$$N(d_2) = .6736$$

$S = \$1200(.8264) - \$924.40e^{-.08(1.0)}(.6736)$

$S = \$416.80$

$D = \$1200 - \$416.80 = \$783.20$

The rate of return on debt is

$r_{A*} = (B_{A*} - D_{A*}) / D_{A*}$

$= (924.40 - 783.20) / 783.20$

$= .18$ or 18%

Thus, the total wealth of the bondholders is

$S + F / (1+r_{A*}) = 416.80 + 124.40 / (1.18) = \$522.20$

To neutralize the wealth shifts with expansion, it is assumed that the proceeds from the new debt are used to expand. In this example, it is assumed that the available investments for expansion are efficiently priced so that the increase in the total value of the assets of the firm is equal to the increase in debt. This is not a required condition for the solution of the expansion case but is added for simplicity. As before, new debt with face value F is added to force the rate of return on all firm debt (or the average return on debt) to its pre-merger level and the value of equity to the sum of the pre-merger equity levels. This is calculated by solving the following equation for F:

$$S = \$522.20 = (\$1200 + F/1.18)N(d_1) - (\$800 + F)e^{-.08(1.0)}N(d_2)$$

This was solved by iteration and it was found that F = $357.00.

The new value of the firm is

$V_{A*} = \$1200 + \$357/1.18 = \$1502.54$

The increase in debt is $357/1.18 = $302.54.

CHAPTER 2
REVIEW OF THE LITERATURE

The prevalence of mergers in modern industrial organizations has stimulated much attention from academe. This attention has resulted in the creation of a large volume of literature. Additionally, the nature of this study draws upon other bodies of literature only tangentially related to the current thrust of merger research.

To facilitate a logical review, the literature is divided into three parts. In the first part, the mainstream merger literature is presented. In general, this research has addressed the questions of why mergers occur, whether there are gains resulting from mergers and how any such gains are distributed between shareholders of firms. The second part of this chapter reviews the existing research on wealth shifts between shareholders and bondholders which occur during mergers. This section deals both with the more rigorous mathematical models which suggest such shifts and the more intuitive explanations of the co-insurance of debt literature. The third part of this chapter examines the agency literature as it relates to merging firms. The final segment of the chapter provides a synthesis of the literature and outlines the motivation for this study.

The Merger Literature

As discussed in the introduction to this chapter, the majority of existing merger literature has been focused on the questions of why mergers occur, whether there are gains to merging firms and if

so, how any such gains are apportioned between shareholders of the acquired and acquiring firms.

A number of theories have been proposed to explain why mergers occur. Copeland and Weston (1983) provide a helpful summary of the following theories:

1. Differential efficiency as a basis for merger,
2. Tax considerations,
3. Inefficient management,
4. Agency problem -- managerialism,
5. Undervalued company -- asymetric information,
6. Synergy,
7. Market power, or antitrust considerations,
8. Strategic realignment to changing environments

(Copeland and Weston, 1983, pp. 562).

The first theory, differential efficiency, is the most general. If two companies differ in the efficiency with which they produce, a merger may result in which the more efficient company acquires the less efficient and then improves its operations. If the benefits from increased efficiency outweigh the transactions costs of implementing such a merger, it will increase the value of the combined firm.

Copeland and Weston also note the effect of tax considerations on mergers.

> One such tax consideration is to substitute capital gains taxes for ordinary income taxes by acquiring a growth firm with a small or no dividend payout and then selling it to realize capital gains. Also, when the growth of the firm has slowed so that earnings retention cannot be justified to the internal revenue service, an incentive for sale to another firm is created. Rather than payout future earnings as dividends subject to ordinary personal income tax, an owner can capitalize future earnings in a sale to another firm. (Copeland and Weston, 1983, pp. 562)

Other tax considerations may also motivate mergers. Firms which acquire other firms with accumulated tax losses may use those losses to offset taxable income. Additionally, "The Economic Recovery Tax

Act of 1981 provided for the sale of tax credits from the use of accelerated depreciation" (Copeland and Weston, 1983, pp. 563).

Mergers may also be considered as a market mechanism for replacing inefficient management. Copeland and Weston note that the inefficient management theory of mergers is closely related to both the more general differential efficiency theory and the agency problem theory. However, they suggest that differential efficiencies most likely explain horizontal mergers while the inefficient management theory provides an explanation for mergers between firms in unrelated businesses.

The fourth theory suggested by Copeland and Weston, agency problems, is central to the study carried out in this dissertation. Therefore, a more complete review of the agency literature is carried out later in this chapter. Briefly, the agency problem theory of mergers suggests that managers may attempt to increase the size and diversification of their firms for personal reasons such as increased management renumeration and reduced risk of bankruptcy.

Mergers may also be explained by an undervalued company theory. Copeland and Weston suggest two reasons that the acquired firm may be undervalued. First, it is possible that there is asymetric information. That is, the acquiring company may have information which is not available to the general market. If this additional information suggests a true value of the firm which is higher than its market value, it will be profitable for the merger to take place. Second, the value of the firm to be acquired may be less than the replacement costs of its assets. If this is so, it may be profitable for a firm to merge to acquire the assets rather than purchase or construct the

assets alone. Studies of this theory examine the q-ratio of merged firms. The q-ratio is defined as a ratio of the market value of a firm to the replacement cost of its assets. If the q-ratio of a firm is less than 1.0, its market value is less than the replacement cost of its assets. Weston and Chung (1983) suggest that fluctuations in the average q-ratio in the economy may explain why mergers tend to occur in waves.

A reason often offered by practitioners for mergers is synergy. The synergy theory of mergers is quite simple. If the combination of two firms will enhance the combined value of the pair, the merger has synergistic effects. While it has been shown by Levy and Sarnat (1970) and Schall (1972) that the simple combination of the two firms does not create value per se, Copeland and Weston note several potential sources of synergy. They note that synergistic gains may arise due to economies of scale in the areas of financing, production, marketing, research and development and other operating areas of the firm (Copeland and Weston, 1983, p. 560). While such gains may be possible, Kitching (1967) notes a tendency for overestimation of the potential gains due to economies of scale in production and operations.

Another theory suggested as explanation for why mergers occur is market power. This theory is somewhat related to the synergy theory and suggests that firms may improve their profitability by increasing their market share. While the validity of this assertion is not proven, it is often accepted as a basis for antitrust action by the Department of Justice. The Justice department believes that undue

concentration in an industry will allow oligopolistic firms to extract excess profits.

The final theory suggested by Copeland and Weston is strategic realignment. They suggest that mergers may result because of firms' need to change to adapt to a changing environment. Recent mergers in the oil and steel industries have been explained in terms of the need to respond to changes in the environment due to foreign competition and reduced energy reserves. Mergers provide a much quicker avenue for change than the slow process of internal reorganization.

The questions of whether mergers result in gains and how any such gains are distributed have resulted in a broad body of empirical research. Weston and Chung (1983), in a recent paper, reviewed the major studies to date. Table 2-1 contains a sample of these empirical studies together with information on the data studied. The studies differ from each other in terms of the time period studied, sample selection characteristics and methodologies. The majority of the studies do employ a variant of residual analysis but the specific applications vary widely.

While one might hope that such attention would have resulted in conclusive answers, the results have unfortunately been ambiguous. However, some issues seem to have been at least partially resolved. There is agreement that the shareholders of acquired firms do receive large significant excess returns from mergers. There is little agreement about returns to shareholders of acquiring firms. It appears that these shareholders do not lose during the merger but the evidence is too inconclusive to determine whether they actually gain. The very nature of this outcome suggests that if the shareholders of

Table 2-1
Empirical Studies of the Gains to Shareholders of Merging Firms

Authors	Sample
Halpern (1973)	150 successful NYSE mergers, 1950-65. Monthly data.
Mandelker (1974)	Mergers consummated between 1941-62; NYSE; 241 acquiring, 252 acquired firms. Monthly data.
Ellert (1976) Part I	205 NYSE mergers challenged by the Justice Department; complaint filed 1950-72; settled by 1974. Monthly data.
Part II	772 large mergers 1950-70; 943 not indicted by Justice Department. Monthly data.
Dodd and Ruback (1977)	172 cash tender offers, 1958-76; 124 successful bidders, 136 successful targets. Monthly data.
Kummer & Hoffmeister (1978)	88 cash tender offer announcement, 1956-74. monthly data.
Langetieg (1978)	149 NYSE mergers, 1929-69. Monthly data.
Bradley (1980)	258 cash tender offers 1962-77; 161 successful, 97 unsuccessful. Daily data.
Dodd (1980)	151 announced merger proposals 1971-77; 71 completions, 80 cancellations. Daily data.
Elgers and Clark (1980)	337 acquiring, 66 acquired firms; FTC large merger series, 1957-75. Monthly data.
Jarrell & Bradley (1980)	161 successful tender offers (same as Bradley above); 47 unregulated, 94 under Federal regulations alone, 20 under state and Federal. Daily data.
Schipper & Thompson (1980)	30 firms which announced and then engaged in aggressive acquisitions programs, 1950-69; mostly conglomerates. Monthly data.
Asquith (1982)	196 successful mergers, 89 unsuccessful mergers, 1962-76. Daily data.
Asquith & Kim (1982)	FTC conglomerate mergers, 1960-78. Shareholder and bondholder monthly and daily returns.
Bradley, Desai & Kim (1982)	104 bidders, 38 targets in unsuccessful tender offers, 1962-80. Monthly and daily data.

Table 2-1 - Continued

Bradley, Desai & Kim (1982)	162 successful tender offers, 1962-80; dollar and percentage gains. Daily data.
Malatesta (1982)	FTC large mergers announced in the Wall Street Journal 1969-74; 272 acquiring, 90 acquired firms. Monthly data.
Wansley, Lane & Young (1982)	203 successfully acquired target firms, 1970-78; categorized by type of merger and method of payment. Daily rates.

Source: Weston, J. Fred, and Kwang S. Chung. "Some Aspects of Merger Theory," Journal of the Midwest Finance Association, 1983, pp. 1-33, reprinted with permission.

acquiring firms gain, they gain very little. The majority of the gains appear to go to the shareholders of the acquired firm.

One study examines this result in a particularly interesting manner. While the majority of the empirical studies examine returns in percentage rate form, Halpern (1973) examined the gains to shareholders in dollars. He found that the total dollar amount of gains to the acquiring firm's shareholders was not significantly different from that accruing to the acquired firm shareholders. He reconciled his results to those of other studies by noting that the tendency for the acquiring firm to be of much greater size then the acquired results in equal dollar gains being shared by the many more shareholders of the acquiring firm. Thus, in rate of return form, the gains to the acquiring firms shareholders appear much smaller and often insignificant.

While most of the empirical studies have examined gains to the shareholders of the component firms, Haugen and Langetieg (1975) examined the combined firm's returns and tested for synergy. Their study differs from the above discussed studies in two ways. First, the examination of gains to each shareholder group individually allows for the chance that gains to one group will be offset by losses to another. Further, Halpern's (1973) results discussed earlier suggest that a large percentage gain to a very small group of acquired firm shareholders could have minimal effect on the overall gains. Haugen and Langetieg's analysis differs in that they examine the combined returns to attempt to determine whether there are any net gains to the combined entity. The second major difference in their study is their methodology. Rather than examining the return

stream for change due to increased returns, they concentrate upon determining whether there are any changes in risk associated with the mergers. Of course, net gains to shareholders can occur because of increased returns or decreased risk. They find no evidence that mergers create synergy in the form of reduced risk.

The Wealth Shift Literature

The body of literature concerned with wealth shifts in corporate mergers has its origins in two areas. One group of authors have examined the effects of mergers from the stockholders perspective and concluded that the reduction in variance that often results from diversification effect in mergers reduces the value of the equity in the firm. Since the value of the firm remains constant, wealth is shifted to the bondholders. Much of this body of literature is based upon option theory. Another approach to the same issue has resulted in the examination of mergers from the perspective of the bondholders. These authors have noted that the combination of two firms results in a co-insurance of debt effect which increases the value of the firms debt. Since, the value of the firm remains constant, this increase in bondholders wealth must come at the expense of the shareholders.

As much of the following discussion is based upon option theory, it appears useful to review its basic results. In a seminal paper, Black and Scholes (1973) outlined the now familiar option pricing model. While the valuation of options had been of interest prior to their discovery, Black and Scholes were the first to formulate a

closed form valuation model in terms of observable exogenous variables. Their model is presented below.

$$c = SN(d_1) - Xe^{-r_f T} N(d_2)$$

where $d_1 = \ln(S/X) + r_f T / \sigma\sqrt{T} + \frac{1}{2}\sigma\sqrt{T}$

$$d_2 = d_1 - \sigma\sqrt{T}$$

where c = the value of the call option

S = the market value of the stock

X = the exercise price of the option

T = the time until the option expires

σ^2 = the variance of the return on the stock

$N(\ )$ = the cumulative probabilities for a unit normal variable.

The option pricing formula has the following properties:

$$dc/ds > 0,\ dc/dX < 0,\ dc/dr_f > 0,\ dc/dT > 0,\ dc/d\sigma^2 > 0$$

That is, the value of a call option increases with increases in the stock price, risk free rate, time to the exercise date or the variance of the returns on the underlying stock. The value of the call option decreases with increases in the exercise price. While the Black-Scholes option pricing model was derived under a number of unrealistic assumptions, including continuous time, frictionless capital markets and no short selling restrictions, the model has proven to be quite robust. Since development of the Black-Scholes model, a number of alternative formulations, based on varied assumptions, have been developed (Rubinstein, 1976; Kim, 1978; Brennan, 1979; and Cox, Ross and Rubenstein, 1978). However, in practice,

their results are very similar to those obtained by the Black-Scholes model.

In their initial paper, Black and Scholes recognized the potential of their model for the valuation of corporate claims. They note that "In effect, the bondholders own the company's assets, but they have given options to the stockholders to buy the assets back" (Black and Scholes, 1973, pp. 649-650). They also note the effect a change in the capital structure will have on the relative positions of stockholders and bondholders.

> An increase in the corporation's debt, keeping the total value of the corporation constant, will increase the probability of default and will thus reduce the market value of one of the corporation's bonds. If the company changes its capital structure by issuing more bonds and using the proceeds to retire common stock, it will hurt the existing bondholders, and help the existing stockholders. The bond price will fall and the stock price will rise. In this sense, changes in the capital structure of a firm may affect the price of its common stock.
> (Black and Scholes, 1973, p. 650)

In a paper immediately following Black and Scholes, Merton (1974) develops a similar model for pricing corporate claims. His results are similar to those of Black and Scholes but his analysis concentrates on the valuation of risky debt and is more complete than the earlier work.

Galai and Masulis (1976) combined the option pricing model with the capital asset pricing model to develop a more complete model of valuation. Their paper was the first to explicitly consider the redistribution effects of mergers. They simplify their analysis by assuming a firm with only one, pure-discount bond issue and one common stock issue. Under this simplifying assumption, they show the value of the firms equity can be priced as a call option on the firms assets, using the Black-Scholes option pricing model.

$$S = VN(d_1) - De^{-r_f T} N(d_2)$$

where $$d_1 = \ln(V/D) + r_f T / \sigma\sqrt{T} + \tfrac{1}{2}\sqrt{T}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

where S = the market value of the equity

V = the market value of the assets

D = the face value of the debt

r_f = the risk free rate of interest

T = the time to maturity of the debt

N( ) = the cumulative probabilities for a unit normal variable.

The authors extend their analysis using case studies, including a study of the effects of conglomerate merger upon the relative positions of the firms' security holders. They consider two firms which for simplicity have equal variance but less than perfectly correlated returns. These firms are then merged in a pure conglomerate merger which they define as having no synergistic effects on the combined value to the firms. They note that the reduction in variance caused by the merger results in a decrease in the value of the equity and an equivalent increase in the value of the debt. Rubinstein (1976) explains this effect by noting that the merger has hurt shareholders by weakening their limited liability. That is, the shareholders of each component firm are made liable for the financial distress of the other. This additional liability, of course, improves the position of the debtholders.

Galai and Masulis note, however, that the effects of this wealth shift can be offset by the increased use of debt by the merged firm.

> In other words, by increasing the debt equity ratio of the merged firm, the market values of the original security holders can be restored to their pre-merger levels. This result is consistent with the claim that mergers "allow" the firms to increase their "debt capacity." (Galai and Masulis, 1976, p. 69)

Shastri (1983) has extended the analysis of Galai and Masulis by allowing the two merging firms to have different variances, maturities of their debt, and leverage. The most important difference in results occur in the analysis of the wealth shifts caused by the changes in variance. Shastri found that in the case where the variance of the combined firm fell between the variances of the component firms, the direction of the wealth shift became ambiguous. The bondholders of the component firm with the higher variance experience a gain in value but the bondholders of the component firm with the lower variance suffer a loss in value. The net position of shareholders depends upon which wealth transfer is larger. Similar results were found in the analysis of maturity and leverage. However, the lack of diversification effects on these variables make the results more straight forward.

While the basic Black-Scholes option pricing model provides a useful model for expositional purposes, its direct applicability for the analysis of real corporate claims is limited. Possibly the greatest hurdle is the requirement that firms hold one issue of pure discount debt which matures at one point in the future. Few, if any, real firms exist with such a capital structure.

Geske (1977) addresses this issue and notes that the real structure of corporate claims is that of a compound option. Consider as an example a firm whose debt is composed of an issue of 10 year annual coupon bonds. The stockholders of this firm now hold a

compound option. At each coupon date, they may choose to exercise their option, pay the coupon, and retain the firm composed of assets and the remaining debt. Should they choose to default on any coupon payment, the remaining coupons and the principal payment are automatically in default. An accurate option pricing formulation must reflect these interdependencies. Geske has formulated such a model. Unfortunately, the solution of the Geske model requires the estimation of the multivariate normal distributions for which no closed form exists and further, one must have estimates of the covariances between the subparts of the option. These requirements render the model unsatisfactory for direct application to real data.

Geske analyzes the properties of his model and fortunately finds that it has essentially the same properties as the more simplistic Black-Scholes model. He finds that the value of the stock (or call in a compound option) is positively related to the value of the firm, the time to maturity, the riskless rate of interest, the variance of the firm and the final expiration of the option. The value of the stock (or call) is negatively related to the face value of the debt or the option's exercise price. Thus, it appears that for most real applications, inferences of the simple Black-Scholes model are robust.

Another, more technical criticism has also been raised against the application of the Black-Scholes option pricing formula to merging firms (Eger, 1983). The Black-Scholes model is formulated on the assumption that the underlying stock's price is distributed lognormally. Therefore, the implicit assumption is made in valuing corporate claims that the assets' value also follows a lognormal

distribution. This is not a troublesome assumption for the evaluation of a single firm. However, in the evaluation of merging firms, the formula is used to value both the merged firm and its pre-merger component parts. If the component firms have values which are lognormally distributed, the value of the combined firm cannot follow a lognormal distribution, as the sum of two lognormally distributed variables is not distributed lognormally. Eger (1983) therefore notes that the Galai and Masulis results are only an approximation.

Brennan (1979) provides a solution to this problem with his contingent claims model which is formulated in discrete time and based upon the underlying asset values following a normal distribution. This solves the distribution problem as the sum of two normally distributed variables also is normally distributed. However, Brennan's model is more complex and not as easily used as the Black-Scholes model. Fortunately, analysis of Brennan's model indicates that its results are very close to those obtained by the Black and Scholes model.

> Using Brennan's model, one can show that the value of the contingent claim (stock) decreases with a decrease in the return variance on the underlying asset (firm). Although this model has some additional limiting assumptions that differ from those of the continuous time model, the relationship between contingent claim value and assets return variance appears robust across models. (Eger, 1983, p. 549)

While the previously discussed studies have been directed at determining whether the option pricing model approach to valuing corporate claims leads to proper inferences, at least two studies have examined whether the magnitude of the wealth shift suggested by option theory is correct. Stapleton (1982) employed a discrete-time

bond valuation model assuming normally distributed cash flows and exponential utility. The results of his analysis suggest that the debt capacity effects of merger may be underestimated by simpler models. He shows that even the merger of two firms with perfectly correlated cash flows can lead to an increase in debt capacity.

> The effect of mergers on bond yields is not simply due to the correlation structure of the earnings. It is clear that even if cash flows are perfectly correlated, then added protection is afforded to debtors if one of the two companies is below its debt capacity at the time of the merger. (Stapleton, 1982, p. 18)

Lam and Boudreaux (1984) also study the wealth shift potential of mergers and analyze the conditions for a redistribution not to occur. Like Stapleton they conclude that the perfect correlation of returns between merging firms does not preclude a wealth shift but unlike Stapleton, they do not require one firm to have excess debt capacity prior to the merger. Their analysis shows that perfect correlation of returns is a necessary but not sufficient condition for the absence of a wealth shift. "In addition, if the market value of the debt claims is to be unchanged, maintaining pre-merger debt promises, merging firms must be perfect scalar multiples" (Lam and Boudreaux, 1984, p.278).

The literature discussed to this point has been based upon variants of the option pricing model. However, one should not conclude that the suggested inferences are somehow peculiar to the use of option theory. Higgins and Schall (1975) have derived very similar results using a state preference model to analyze cash flows. They analyze the effect of the merger on the total value of the firms using Schall's (1972) Value Additivity Principle (VAP) and assuming

perfect capital markets. They then examine the effect of the merger on the relative positions of the debt and equity holders.

> In terms of conglomerate merger, the VAP implies that merging N firms into firm T merely to diversify income streams will produce no increase in total value; the sum of the values of the N firms if not merged will equal the total value of the firm created by the merger, provided only that the total payments of the new firm equals the sum of the payments of the firms if not merged (i.e. provided that the merger is purely conglomerate). Thus, if firms 1 and 2 combine into T, the VAP implies that the value of firm T will equal the sum of the values of firms 1 and 2 if they were not merged. This is so regardless of any diversification effects of merger which may reduce the probability of bankruptcy.
>
> It is important to understand that the above arguments do not imply that either total stock or total bond values will be the same before and after merger. In fact, if the pre-merger debt remains outstanding after merger, . . . bond values will generally rise and stock values fall due to the merger. (Higgins and Schall, 1975, pp. 98-99)

Two empirical studies have examined the wealth shift potential of mergers and explicitly noted the potential for neutralizing these shifts by increasing the leverage in the post-merger firm. The earlier paper, by Kim and McConnell (1974) outlines the basic wealth shift arguments and concludes that a firm which is managed to maximize the wealth of the shareholders will neutralize the wealth shifts from equity to debt though an "increase in their use of financial leverage to the point where the post-merger default risk of the previously outstanding debt is increased sufficiently to negate the co-insurance effect and to cancel any wealth transfers from equity holders to debtholders" (Kim and McConnell, 1977, p. 352). They note that if these neutralizing actions are taken, an examination of bondholder returns around the merger date should find no evidence of abnormal returns. Further, they suggest that one should observe that merged firms increase their use of debt around the time of the merger. Their study finds evidence to support both hypotheses. The

returns to bondholders showed no significant signs of excess returns around the merger dates and of 31 firms in their sample, 18 to 26 showed increased leverage after the merger depending upon the leverage measure used.

It should be noted, however, that Kim and McConnell's analysis is incomplete in at least two ways. First, their analysis was performed on an average of bond returns for all firms in the sample. Shastri (1983) has shown that bondholders do not always gain. Thus, including all bonds in an index may result in bonds with positive excess returns being negated by bonds with negative excess returns. Second, Kim and McConnell's analysis of changes in capital structure was extremely simplistic. While they noted that a large percentage of the sample firms increased their use of debt, no attempt was made to determine whether these shifts were related to the tendency for wealth shifts. The purpose of this dissertation is to study this issue.

The second study which explicitly allowed for the neutralization of wealth shifts is by Eger (1983) who performed an analysis similar to Kim and McConnell but used a more selective sample which controlled for changes in leverage. Her results are supportive of the theories which predict wealth shifts as she finds statistically significant gains to debtholders as a result of pure exchange mergers. Eger's methodology is also interesting because of her selection of variables used in the analysis. Her analysis indicated that leverage was satisfactorily proxied as (book value debt / (book value debt + market value equity)). Eger's also noted the empirical problems of proxying the variance of firms returns.

> Because total firm returns are not observable, their returns' variance and covariances cannot be calculated directly. These surrogates for firm returns' variance were used in this study: stock returns' variance; weighted stock returns variance; and accounting returns' variance. If all of the securities of a firm other than the common stock are riskless, then stock returns' variance weighted by the square of (stock value / (stock value + debt value)) would be the firms returns' variance. However, it is clear that the firms used in this study have risky debt outstanding, and in this case the weighted stock returns' variance would be an understatement of the firm returns' variance. However, in general, unweighted stock returns' variance is an overstatement of firm returns' variance. Since an examination of only the direction of change if firm returns' variance is needed in this study, both of these surrogates were examined as approximations. (Eger, 1983, p. 556)

Two authors have examined the wealth shift effects of mergers in a different way. Lee (1977) and Lewellen (1971) concentrate on the effect mergers have upon the riskiness of the firms' debt. They note that the merger creates a co-insurance effect which increases the value of the firm's debt. It is important to note that while the results are identical to those of the previously discussed studies, the concentration is upon the effect of the reduced variance on bondholders rather than stockholders. Lewellen argues that the value of a firm's debt and its ability to borrow is determined by the distribution of the cash flows available to service the debt and the probability of those cash flows being below the minimum required to maintain solvency. This is consistent with the much earlier work of Donaldson (1962) who argued that firms must be concerned with the "maximum adverse limits" of their cash flows. Lewellen argues his point as follows:

> Put differently, the lender concern is almost exclusively with the probabilities attached to "disaster" levels of borrower cash flow outcomes -- a disaster being defined as an inability to meet the interest and repayment commitments specified by the loan agreement. The body of published analytical work on lender decision rules and the concern with interest and sinking fund "coverage" ratios by lenders, underwriters, borrowers, and rating

> services, all attest to the prevalence of this attitude. Accordingly, in addressing the notion of corporate debt "limits" or debt "capacities" with reference to companies who merge, our concern should be with the effects of merger on the lower tail of the resulting probability distributions of corporate earnings outcomes. (Lewellen, 1971, p. 526)

Lewellen, claims that it is the area within the tail of the cash flow distribution below the disaster level that determines the value of debt. He notes that the combination of two firms' cash flows, which are not perfectly correlated, will result in a decrease in the area in the tail of the distribution and therefore increase the debt capacity of the combined firm.

> Should the two companies merge, however, the likelihood of disaster at the same aggregate scale of lending must inevitably decline, as long as the relationship between the annual cash flows of the combining enterprises is such that, prior to merger, default on their respective loans did not always occur simultaneously. (Lewellen, 1971, p. 530)

The co-insurance arguments lead to identical conclusions regarding the effect of mergers on the relative positions of debt and equity holders.

The Agency Literature

Earlier in this chapter, eight popular motives for corporate mergers were outlined. Essentially, all of these motives are based on the belief that the combination would result in net gains or synergies which would not otherwise be available. However, other studies discussed showed no clear indication that such gains normally materialize. Why, then, are mergers so prevalent? One suggested answer to this question is based in agency theory.

Jensen and Meckling (1976) provide the most comprehensive framework for analysis of the agency relationship. They note that an agency relationship exists when one or a group (principals) contracts

with another person or group (agents) to perform some service which involves delegating some decision making authority to the agents. If both principal and agent are utility maximizers, there is a tendency for the agent to take some actions which are not in the best interest of the principal. While there may be incentives, bonding and monitoring systems instituted to reduce the agent's divergences from the principal's interests, the systems will not, in general, result in the agent always acting in the principals best interest. The framework is directly applicable to the modern corporation which is managed by non-owner managers.

Fama (1980) argues that, while Jensen and Meckling's analysis is essentially correct, there are signals provided by the managerial labor market and the capital markets and other market mechanisms which discipline managers. Thus the agency relationship does not create a divergence between owners' interests and management's actions. Any actions taken by management are subject to an ex post settling process which eliminates any potential for gain at the shareholders expense. That is, managers who attempt to extract extra perquisites are penalized in the future wage market negating the gain. However, Fama notes that the system is not perfect.

> No claim is made that the wage revision process always results in a full ex post settling up on the part of the manager. There are certainly situations where the weight of anticipated future wage changes is insufficient to counter balance the gains to be had from ex post shirking, or perhaps outright theft, in excess of what was agreed ex ante in a manager's contact. (Fama, 1980, p. 306)

Thus, it appears that while there may be market mechanisms which reduce the impact of the agency problem, the controls are

insufficient to prevent all problems. Thus, it appears possible that managers may engineer some mergers for personal gain.

Amihud and Lev (1981) examine the effect of the agency relationship on merging firms and conclude that managers may tend to pursue mergers as a method of reducing their personal risk. "Specifically, managers, as opposed to investors, are hypothesized to engage in conglomerate mergers to decrease their largely undiversifiable "employment risk" (i.e., risk of losing job, professional reputation, etc.)" (Amihud and Lev, 1981, p. 605). The authors note the literature which shows that diversification does not create value for the investors who may personally diversify. However, they argue that a large portion of the managers personal wealth is in the form of human capital and based upon the future of the firm he manages. This exposed the manager to a large degree of risk which cannot be diversified in the security markets. The manager may only diversify this "employment risk" by diversifying the firm itself, a task most easily accomplished by corporate merger. Further, the management will have an incentive to pursue such mergers even if they result in no gain, or even a loss, to the firm's shareholders.

It is important to note that Amihud and Lev's analysis is only applicable to management of the acquiring firms. Management of those firms which are acquired often are in risk of being replaced. This may explain why so many takeovers are vehemently opposed.

Boudreaux (1973) finds empirical evidence consistent with Amihud and Lev's results. He finds evidence that firms with less control exerted by owners exhibit lower levels of risk and return. This suggests that managers may be attempting to reduce their employment

risk by reducing the risk, and hence the expected return, of the firms they manage. This article is interesting in two respects. First, it provides empirical evidence of Amihud and Lev's contention that managers are concerned with "employment risk." Second, the fact that such differences in the risk-return characteristics of owner versus manager controlled firms exist tends to support Fama's contention that the ex post settling up process is imperfect.

There are also other possible reasons that managers might pursue mergers. Firth (1980) finds evidence that senior management pay is more closely related to firm size and growth than profitability. They noted that mergers did not tend to improve the financial position of shareholders but did result in financial gains to management. They note that "this evidence is consistent with takeovers being motivated by maximization of management utility reasons" (Firth, 1980, p. 258).

Meeks and Whittington (1975) find similar results in their examination of directors pay. They find that firm size is a significant factor in explaining directors pay. However, they qualify their findings by noting that on a year to year basis, growth is no more important than profitability.

It is important to note that the issue of the determinants of managerial pay is not completely resolved. In a study carried out prior to that of Meeks and Whittington, Lewellen and Huntsman (1970) find evidence that managers are rewarded for profitability, not size or growth, in the face of such conflicting evidence, one can only conclude that all three factors, profitability, size and growth may be determinants of managerial pay. However, to the extent that size

and growth are beneficial to managers, mergers provide an ideal avenue to both.

Summary

The size of this chapter is indicative of the voluminous literature of corporate mergers. It appears useful to review a few of the major results. It was noted that there are several theories which have been put forth to explain mergers. Essentially all of these theories are based upon the belief that mergers capture synergies. However, examination of security returns seems to suggest that few if any gains accrue to the shareholders of the acquiring firm. Further, the wealth shift literature suggests that, in the absence of synergies, mergers generally result in a loss to shareholders and a gain to bondholders. It was also shown that such wealth shifts may be neutralized by increases in leverage.

It is within this framework that this study is set. This study tests whether managers take action to neutralize the wealth shifts. Further, since it has been argued that managers may often pursue personal goals, the role of synergies is examined. Synergies are important because their existence could allow managers to not increase the firm's debt enough to completely offset a wealth shift yet shareholders could still experience no loss, and possibly gain. Thus prior examinations of shareholder returns in merging firms which did not control for changes in leverage may have been misspecified.

CHAPTER 3
HYPOTHESES AND METHODOLOGY

Introduction

The empirical validity of the relationships between security returns, debt capacity, synergies and managerial response are the central issues of this dissertation. Specifically, the following two central hypotheses will be tested against two alternate hypotheses:

Central Hypothesis 1: Managers act as if they are aware of the wealth shift potential of mergers and take neutralizing actions commensurate with the magnitude of the shifts. That is, managerial response is directly related to the magnitude of the potential wealth shifts.

Central Hypothesis 2: The degree of managerial response is inversely related to the magnitude of potential synergies available from the merger, because the presence of synergies allows wealth to be hidden by offsetting gains.

Alternate Hypothesis 1: The changes in capital structure which occur during a merger result from managers reactions to existing conditions in the financial markets at the time of the merger.

Alternate Hypothesis 2: The changes in capital structure which occur

during a merger are simply a result of the terms of the merger.

This chapter is organized into five sections. The first section following this introduction outlines the events under study, defines the needed variables and presents the general model. Next, the specific empirical tests are developed. The following section discusses the measurement of the critical variables used in the study. Finally, the sources of data are outlined.

Events, Definitions and the General Model

This study concentrates on the effects of the merger on the acquiring firm's shareholders. Throughout the study, the acquiring firm is designated as firm A prior to the merger and as firm A^* after the merger.

The time period under study for each merger can be divided into three parts: the base period, the adjustment period and the post-merger period. As in all studies which examine the effect of an event, a base period is needed with which to compare later results. The base period in this study was taken to be the 52 weeks ending four weeks prior to the first informational impact of the merger on security prices (time I). The method used to determine date I is outlined later in this chapter. Halpern (1973) has found evidence that the formal announcement date (time A) is generally after the date at which the market first learns of the pending merger. Since the goal is to find a base period during which the impact of the merger is not included in the variables under examination, the formal announcement date (A) is not of great importance in this study.

However, announcement dates were gathered and were taken to be the first announcement in the Wall Street Journal of the pending merger. The adjustment period over which the changes in the test variables are measured was taken to be the period beginning four weeks prior to the point of first informational impact (I) and ending 26 weeks after the consummation date, the date at which the merger was legally completed as reported in Mergers and Acquisitions (1968 - 1983) (time C). The post-merger period is taken to be the period following 26 weeks after the consummation date.

The general form of the test equation is as follows:

$$\Delta D_i = f(\Delta V1_i, \Delta V2_i, \Delta M_i, \Delta I_i, \Delta E_i, C_i, S_i)$$

where ΔD_i = the change in leverage associated with merger i,

$\Delta V1_i$ = the change in variance associated with the acquiring firm in merger i,

$\Delta V2_i$ = the change in variance associated with the acquired firm in merger i,

ΔM_i = the change in the weighted average maturity of debt in merger i,

ΔI_i = the change in average long term interest rates from the base period to the adjustment period,

ΔE_i = the change in the average level of the stock market from the base period to the adjustment period,

C_i = the ratio of cash used during the merger transaction to the post-merger value of the merged firm,

S_i = the index of relative synergy resulting from merger i.

Changes in the levels of debt (ΔD) are measured by comparing financial statements and market data from the last financial report

prior to time I with the first available report following time C plus 26 weeks. The decision to measure the debt changes by examining data 26 weeks after the consummation of the merger rather than immediately after the consummation date was made to better ensure that the results represented a change in capital structure rather than a temporary increase or decrease in debt around the merger date.

The explanation of the actual changes in the debt levels of merging firms requires variables which measure the theoretical debt capacity or wealth shift potential of mergers. The change in variance ($\Delta V1_i$) and the change in the maturity structure (ΔM_i) caused by the merger are included to reflect the wealth shifts potential.

Shastri (1983) has noted that it is possible that the bondholders and stockholders of each component firm in a merger experience wealth shifts of opposite direction. That is, the bondholders of the acquiring firm may gain while the bondholders of the acquired firm may lose. He notes this may occur when the variance of the combined firm falls between the variances of the component firms. The emphasis in this study is on the effect of the merger to the shareholders of the acquiring firm. However, to test for the possibility of an offsetting wealth shift in the acquired firm resulting in a change or moderation of the change in capital structure, the variable $\Delta V2_i$ is included. This variable measures the change in variance experienced by claimants of the acquired firm.

The role of synergies in determining debt policies is examined with the use of the variable S_i which is measured as the relative change in value of the merging firms compared to control firms in similar businesses. The measurement of this variable is detailed

later in this chapter. Two techniques will be employed to test the effect of synergies. First, the variable will be included in the test equations and the impact of its presence both in terms of its significance and sign and its affect on the coefficients of other variables will be examined. Second, the sample will be split into two subsamples by relative size of the synergy variable. The test equation will be estimated on each subsample independently and differences between the two examined.

In any research which attempts to explain the movement of one variable in terms of the movements of others, one must be careful to ensure that significance is not obtained because of the omission of another variable. The two alternate hypotheses are included as possible explanations of the observed changes in leverage. It may be that mergers tend to happen at times coincident with declining interest rates that make increasing the debt levels of firms desirable. To test this hypothesis the variable ΔI is collected which compares borrowing rates during the merger period (I-4 to C+26) with the base period. A similar possibility is that increased debt may simply be the result of unattractive equity markets coincident to the merger period. To test this hypothesis ΔE is collected which compares stock market levels during the merger period with the base period. A second hypothesis is that the increased debt level is simply a response to the need for excess cash to fund the merger transaction which remains in the capital structure. To test this hypothesis, the variable C_i is included which measures the cash used in the merger as a proportion of the post-merger firm.

Tests of Hypotheses

The preceding section presents the general form of the model and defines the critical variables of the study. A detailed outline of the methodology which has been designed to allow the measurement of these variables is contained in the next section.

If the first hypothesis is true, one should observe a direct relationship between the amount of debt capacity created, as reflected by decreasing variance and declining maturity of debt, and the change in the proportion of debt held by the merging firms around the merger (ΔD_i). If the first alternate hypothesis is true, one should observe an inverse relationship between ΔI and ΔD and between ΔE and ΔD. If the second alternative hypothesis is true, one should observe a direct relationship between the amount of cash used in the merger and the dependent variable. Note that the role of the synergy variable and the second central hypothesis is not discussed at this time. Additionally the linear form of the test equation which follows does not include the synergy variable. This exclusion is deliberate. The tests in this study will be carried out in two separate phases. The first series of tests assumes the maximization of shareholders wealth by managers and tests the first central hypothesis against the two alternate hypotheses. The second series of tests relaxes the wealth maximization assumption and allows for the possibility that managers may attempt to capture some of the benefit of available synergistic gains for themselves. This second series of tests examines whether the assumption of wealth maximization appears valid for the firms studied.

The linear form of the test equation for the first series of

tests is as follows:

$$\Delta D_i = \gamma_0 + \gamma_1 \Delta V1_i + \gamma_2 \Delta V2_i + \gamma_3 \Delta M_i + \gamma_4 \Delta I_i + \gamma_5 \Delta E_i + \gamma_6 C_i + \varepsilon_i$$

Where $\gamma_0, \gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5, \gamma_6$ are the regression parameters

ε_i = the random error of the regression.

The linear form of the test equation for the second series of tests is identical to the above form except for the inclusion of the synergy variable S_i. As discussed earlier, two forms of the test equations will be estimated in the second series of tests. The first form will include the variable S_i in the equation linearly with the coefficient γ_7. The second form will use S_i to divide the sample into two subsamples. The test equation from the first series of tests will be reestimated for each subsample and differences examined.

As is discussed in more detail in the next section, some of the above variables may be measured in more than one way. Changes in leverage may be measured in book value or market value and both upper and lower bounds of the variance variable may be computed. The main series of tests used book value definitions of leverage because of the availability and stability of the measures. A market value proxy which had been used by other authors was also tested and will be reported in an appendix to the text. Comparison of these formulations will provide information on which variables are most useful proxies of managerial response and the sensitivity of the general model to different formulations.

For a statistical test to be meaningful, the researcher should be able to define the expected signs of the coefficients of the test

equation prior to the test. If the central hypothesis is correct and managers are acting as if they are aware of the potential for wealth shifts and acting to neutralize these shifts, the values for γ_1 and γ_3 should be negative and significant. Shastri's (1983) analysis suggests that the sign of γ_2 should also be negative.

Analysis of the expected sign of the coefficient of the synergy variable, S_i, is particularly interesting. If the second central hypothesis is correct and the existence of synergies allows managers to refrain from increasing leverage as much as they would have without synergies, the sign of γ_7 should be negative and significant. This would be evidence of an agency problem and indicate that managers are using synergistic gains to offset wealth shifts. In this case, shareholders may still appear to gain from the merger but the gain will be less than that had the wealth shift also been neutralized. It should be noted that the managers have an incentive to do this because increasing the leverage increases the financial risk of the firm and thus increases the managers employment risk.

A positive sign for the coefficient of S_i is evidence that managers are aggressively pursuing a goal of shareholder wealth maximization. As was illustrated by the simple example in chapter one, in the absence of any managerial action to increase leverage, both bondholders and stockholders share in synergistic gains from merger. In fact, the value of debt increases more when synergies are available than when there are no such gains. Thus, if managers are actively pursuing a wealth maximization policy, the increase in leverage in a synergistic merger will be larger that in a non-synergistic one.

It is also possible that the coefficient of S_i will have a sign not significantly different from zero. This is evidence that the values of synergies do not affect managerial action. This dissertation is the first study which has hypothesized any relationship between management's debt policies and synergistic gains in mergers. It is possible that management does not consider synergistic gains in determining changes in leverage around mergers. It is also possible that management judges such gains without reference to the effect the merger has had on the market price of the companies' shares.

The variables ΔI_i, ΔE_i and C_i are suggested by the alternate hypotheses and are included in the analysis to control for other market influences which might affect the leverage of a firm. If the changes in leverage are simply the result of general market conditions which make debt more attractive because of a decline in interest rates, one should observe a negative and significant value for γ_4. If the changes in leverage are the result of a deterioration in the equity markets which are forcing companies to substitute debt for equity, a negative value should be observed for γ_5. If the changes in leverage are simply a response to the need for cash to finance the merger, one should observe a positive and significant value for γ_6.

Measurement of Critical Variables

The tests presented in the previous section of this chapter require variables which proxy the changes in variance and maturity and measure synergistic gains and other market influences which may affect leverage. Further, the proper measurement of these variables

requires the determination of a base period during which the variables can be measured prior to any impact of the merger. Thus, a method of estimating the point of first informational impact of a merger is needed. The section outlines the estimation of the variables used in this study.

Changes in Leverage -- ΔD_i

The change in leverage ratio, ΔD_i, is measured as the change in the total debt to total assets ratio from the last available financial report prior to I-4 to the first available report after C+26. An example should clarify the measurement of ΔD_i. Consider two equal sized firms. Firm A has a pre-merger (time I-4) debt ratio of .2, while firm B's is .3. The merger of these two firms should result in a post-merger debt ratio of .25 for the combined firm. Suppose a debt ratio of .35 is observed in the post-merger period. The variable ΔD would be calculated as follows:

$$\Delta D = .35 / .25 = 1.40$$

Total debt was chosen over long term debt for two reasons. First, because of the accounting convention to report any debt which has a maturity of less than 1 year as short-term, it is possible for firms to carry sizable amounts of demand loans which are consistently rolled over for long periods as short-term debt. Secondly, many mergers are initially financed by short-term debt which is subsequently refinanced with long-term sources. Short-term funds are often initially used because they are easier to raise quickly than a long-term loan or bond issue. It is also noted that for many

companies, which carry minimal short-term debt, the difference between using total and long-term debt is insignificant.

The main test equations presented in this study use leverage defined in accounting terms. Accounting data were used because of the accuracy with which accounting leverage may be measured and the stability of the measure relative to market value estimates. Since market value leverage is unobservable, some proxy must be used. The proxy used in this study is that of Eger (1983), who approximated the market value of total assets as the market value of equity plus the book value of debt. This, Eger notes, results in a closer approximation of the market value of the total assets. It differs from the true market value of total assets by the difference between the book value of debt and the market value of debt. A preferable estimate would include the market value of debt. However, its estimation is difficult and subject to even larger estimation errors.

Variance -- $\Delta V1_i$ and $\Delta V2_i$

Two variance variables appear in the test equation. The first variable, $\Delta V1_i$, is of primary importance as it represents the change in variance experienced by the shareholders of the acquiring firm, and it is the actions of the managers of this firm which are under study. The second variance variable, $\Delta V2_i$, is included to test for differing intra-firm wealth shifts in the acquired firm which Shastri (1983) suggests may impact the magnitude of the total wealth shift.

The variables are calculated, for each merger i, as follows:

$$\Delta V1_i = \sigma_{AB}^2 / \sigma_A^2$$

$$\Delta V2_i = \sigma^2_{AB} / \sigma^2_B$$

where $$\sigma^2_{AB} = \theta^2_A\sigma^2_A + \theta^2_B\sigma^2_B + 2\theta_A\theta_B\sigma_A\sigma_B\rho_{AB}$$

and $$\theta_A = V_A / V_A + V_B$$

$$\theta_B = V_B / V_A \oplus V_B$$

where V_A, V_B = market value of equity plus the book value of debt for firms A and B respectively,

σ^2_A, σ^2_B = the pre-merger variance of the returns of the component firms, A and B,

σ^2_{AB} = the estimated post-merger variance of the combined firm A*,

ρ_{AB} = the correlation between the returns of the component firms.

The variance variables should theoretically represent the variance of the return on value of the total firm. Since this variable is unobservable it must be proxied. Following similar work done by Eger (1983), two proxies will be used in different estimations of the test equation. The true variance of the return on value for any firm j is as follows:

$$Var(R_{v,j}) = \gamma^2_j\sigma^2_{d,j} + (1 - \gamma_j)^2\sigma^2_{s,j} + 2\gamma_j(1 - \gamma_j)\rho_{sd,j}\sigma_{d,j}\sigma_{s,j}$$

where $\sigma^2_{d,j}$ = the variance of the return of firm j's debt during the period,

$\sigma^2_{s,j}$ = the variance of the return of firm j's stock during the period,

γ_j = the proportion of debt in firms j's capital structure,

$\rho_{sd,j}$ = the correlation coefficient of the two return streams.

However, as Eger noted, the estimation of $\sigma^2_{d,j}$, like the estimation of the market value of debt, is subject to large estimation errors which could damage the usefulness of the resulting estimation. Because of this, the estimation of $\sigma^2_{d,j}$ is not attempted in this study. Instead, two estimates of the variance variables were collected which represent the upper and lower bounds on the estimates of the true variance. The first estimate, the variance of the return on equity, $\sigma^2_{s,j}$, represents an upper bond as the variance of debt returns must be less than the variance of equity returns for any firm. Substituting $\sigma^2_{d,j} = \sigma^2_{s,j}$ into the $Var(R_{v,j})$ equation yields the result $Var(R_{v,j}) = \sigma^2_{s,j}$.

While the upper bound for $\sigma^2_{d,j}$ is $\sigma^2_{s,j}$, the lower bound for $\sigma^2_{d,j}$ is 0, as variance cannot be negative. Substituting, this estimate into the $Var(R_{v,j})$ equation yields the following result:

$$Var(R_{v,j}) = (1 - \gamma_j)^2 \sigma^2_{s,j}$$

These two estimators are proxied in this study using the variance of equity returns over the base period as the estimate of σ^2_s and using the market value of equity divided by the market value of equity plus the book value of debt as the estimate of $(1 - \gamma_j)$. The variance estimators are summaried as follows:

$$_U\sigma^2_A = \sigma^2_{S,A}$$

$$_L\sigma^2_A = \sigma^2_{S,A} \left(MV_{E,A} / (MV_{E,A} + BV_{D,A})\right)^2$$

$$U\sigma_B^2 = \sigma_{S,B}^2$$

$$L\sigma_B^2 = \sigma_{S,A}^2 \left(MV_{E,B} / (MV_{E,B} + BV_{D,A})\right)^2$$

where $U\sigma_A^2$, $U\sigma_B^2$ = the upper bound estimates of the variances of firms A and B respectively,

$L\sigma_A^2$, $L\sigma_B^2$ = the lower bound estimates of the variances of firms A and B respectively,

$MV_{E,A}$, $MV_{E,B}$ = the market value of the equity of firms A and B respectively,

$BV_{D,A}$, $BV_{D,B}$ = the book value of the debt of firms A and B respectively.

Maturity -- ΔM_i

The longer the time period to the exercise date, the larger the value of an option. Thus, the longer the maturity of a firms debt, the greater the value of its stock. This suggests that any actions which reduce the maturity structure of the firm's debt will create a wealth shift away from the shareholders. This results in increased wealth shifts as greater increases in the level of debt are required to neutralize this shift. To measure this effect empirically, the following variable was measured:

$$\Delta M_i = WAMD_{A*} / WAMD_A$$

where $WAMD_A$* = the weighted average maturity of debt of the combined firm after the merger, measured at the beginning of the post-merger period,

$WAMD_A$ = the weighted average maturity of debt of the

acquiring firm before the merger, measured using the first available data prior to the point of first informational impact.

It should be noted that Shastri (1983) predicts a similar intra-firm wealth shift potential from change in maturity as from change in variance. This would suggest the inclusion of another maturity variable to measure the effect of the merger on the maturity of the acquired firm. However, this is not needed for two reasons. First, Shastri notes the effect of the maturity change will not alter the direction of the total wealth shift. Additionally, the second maturity variable would be collinear with ΔM_i as there is no diversification effect with maturity. The combination is strictly linear. Therefore, a second maturity variable is not needed.

Change in Interest Rates -- ΔI

In order to allow for the possibility that the changes in leverage are simply due to changes in the attractiveness of borrowing rates, the variable ΔI_i is included. This variable is measured as a ratio of the average weekly rate of interest on long-term government bonds during the adjustment period to the average weekly rate during the base period. If rates have fallen, ΔI_i will be less than one. If rates have risen, ΔI_i will be greater than one.

Change in Equity Costs -- ΔE

Using a similar argument to that for including an interest rate variable, it is possible that leverage changes are the result of changes in the attractiveness of raising capital in the stock market.

When the stock market is high in value relative to a prior period, it may be that firms will prefer to raise capital with stock issues thus reducing leverage. Alternately, when the market is at a low level relative to prior periods, firms may prefer to raise capital by borrowing, thus increasing leverage. To capture this effect, the variable ΔE_i is included. This variable is measured as a ratio of the average value of the value weighted market index during the adjustment period to its average level during the base period. The market is approximated using the value weighted index of the Center for Research in Security Prices at the University of Chicago. An example may clarify the measurement of ΔE_i. Suppose that for some merger, the average value of the market index during the base period was 1.2 and during the adjustment period was 1.8. In this case ΔE_i would be calculated as $\Delta E_i = 1.8 / 1.2 = 1.5$ indicating a rise in the market.

Demand for Cash -- C_i

To allow for the possibility that the change in leverage is simply a response to the need for cash to finance the merger, the variable C_i is included. The variable C_i is measured as the ratio of cash used in the merger transaction to the post-merger value of the combined firm as previously estimated.

$$C_i = \frac{\text{Cash used in merger i}}{\text{Total assets } A^*}$$

C_i is also computed in book value form with the total assets of the post-merger firm in the denominator of the above ratio replaced by the market value proxy discussed earlier.

Synergy -- S_i

It is hypothesized that the degree of managerial response is inversely related to the magnitude of any synergies that are available to the shareholders of the acquiring firm. That is, the existence of synergistic gains allows the three parties in the mergers (shareholders, bondholders and managers) to simultaneously gain. Therefore, even if the merger results in wealth shifts from the shareholders to the bondholders, the shareholders may still experience net gains from their share in the synergies. In such a merger, where the shareholders have registered overall gains, one might expect that the incentives for managers to neutralize the wealth shifts would not be nearly so great.

The empirical test of this hypothesis requires a method of measuring the synergies available to management and shareholders of the acquiring firms. However, it should be noted that the measure should capture the expected synergies *a priori* rather than the actual realized synergies. Managerial action during the merger must be influenced by expected gains. As is discussed in more detail in the following pages, all existing measures of synergy measure realized rather than expected synergy. This problem may result in significant measurement error.

Three commonly used methods of estimating synergies currently exist. The first is *ad hoc* and attributes synergy to mergers between firms in the same line of business. Conglomerate mergers are considered to be non-synergistic. Measured in this way, the variable S_i is a dummy with a value of one if the merger is synergistic and zero otherwise. This form of the variable was used in the tests. There

are a number of problems with this measure of synergy. First, the variable is a dummy which allows no distinction between mergers which have large synergistic gains and those with only small gains. Second, synergies do not necessarily result from all combinations of firms in the same industry nor is it impossible that conglomerate mergers result in gains. For example, synergies may result from the transfer of tax losses in conglomerate mergers.

The two other measures of synergy are based upon actual changes of the stock prices of the merging firms. Both techniques divide the price changes which occur around mergers into two portions. The first portion is that which would have been expected had the merger not occurred, and is based on the movements of a control group. The second portion is attributed to synergy. The two methods differ only in their choice of control group. The first method uses a market model to control for expected movements in price. The second method uses individual control firms in the same industry. The market model technique was considered for this study but was dismissed. Individual securities are known to have very low correlations to the general market when considered individually while the specific control firms are much more highly correlated and thus control for a higher proportion of variation. This occurs because the market model index will not, in general, capture as many industrial and company effects as the control sample technique. Thus, the control sample approach is better.

Using the control firm technique, synergy is defined as increases in equity values which result from a merger beyond what could have been achieved by simply holding a two stock portfolio of the two

independent firms. A numerical example may be helpful. Consider two firms, A and B, in a one period world. Initially each firm's equity is valued at $100. At the end of the period, if no merger occurs, A is expected to be worth $120, and B, $130. Assume the firms merge at the beginning of the period and that the expected value of the combined firm's equity (A^*) is $275. Under the definition of synergy employed in this study, and ignoring the time value of money for simplicity, the synergy created by this merger is

$$\$275 - (\$120 + \$130) = \$25.$$

This definition of synergy is conceptually similar to that of Haugen and Langetieg (1975). However, they concentrate on changes in the distribution of returns where this study examines changes in value. Specifically, the methodology is designed to partition changes in value of the merged firm in the post-merger period into two categories. The first is the increase that would be expected to accrue to an investor holding the two firms' stock had no merger taken place. The second is the change in value that occurs above this level, if any, which can be attributed to synergies resulting from the merger.

To estimate the change in value which would have been expected without the merger, paired control firms from the same industries as the merging firms are utilized. The control firms are chosen using Haugen and Langetieg's (1975) technique of choosing the firm with the same Standardized Industrial Code that has the highest correlation of returns with the firm under study. In this study, each merging firm in the sample was paired with that firm which had the same four digit Standardized Industrial Code and exhibited the highest correlation of

returns. Where no feasible control firms were available with identical Standardized Industrial Codes, firms whose codes were within two digits were used. This technique ensured that firms from very similar industries were chosen. Using data from time I-4, two equal value portfolios were constructed.

$$(N_{A,I-4})(P_{A,I-4}) + (N_{B,I-4})(P_{B,I-4}) = W_i(\theta\, P^C_{A,I-4} + (1 - \theta)\, P^C_{B,I-4})$$

where $P_{A,I-4}$, $P_{B,I-4}$ = the price per share of equity at time I-4 for firms A and B respectively,

$N_{A,I-4}$, $N_{B,I-4}$ = the number of outstanding shares at time I-4 for firms A and B respectively,

$P^C_{A,I-4}$, $P^C_{B,I-4}$ = the price per share of equity for the control firms at time I-4 for firms A and B respectively,

θ = market value of equity of A divided by the sum of the market values of A and B,

W_i = a scaling factor to force the equality, and the remaining parameters are defined as before.

The total synergy attributed to the merger is measured as follows:

$$S_{TOTAL} = P_{A*,C+26} + c_i - W_i\,(P^C_{A,C+26}\,\theta + P^C_{B,C+26}(1 - \theta))$$

The variable c_i is the total amount of cash used during the merger. It is added S_{TOTAL} in the above equation because it represents wealth which has accrued to owners of the original portfolio of the two merging firms prior to the merger. Since the S_{TOTAL} variable will differ in size across mergers simply due to scale, it is standardized

in the tests as follows, for each merger i.

$$S_i = S_{TOTAL} \; / \; W_i \; (P^C_{A,C+26} \; \theta + P^C_{B,C+26} \; (1 - \theta))$$

It may be argued that, in an efficient market, the value of the firms at time I-4 will include the expected effect of the merger and that, therefore, S_i can be expected to, on average, equal zero. Halpern (1973) offers an explanation to refute this assertion. He suggests that merging firms may have unique characteristics which allow synergistic gains to be captured only in mergers with specific partners. The probability of these two firms finding each other will not, in general, be unity and thus security prices will not reflect total potential synergistic gains.

For completeness, the resulting S_i was tested in two forms. As calculated, S_i is a continuous variable and was used in this form. Additionally, the continuous variable was used to create a dummy variable. The sample was ranked by S_i and the half with the higher values were considered as highly synergistic and the others as having low synergies. This formulation allows a more direct comparison of the control group measure to the ad hoc measure discussed earlier.

Point of First Informational Impact -- I

To properly capture the full effect of a merger on a variable under measurement, a base period prior to the event must be determined during which no effect of the pending merger is felt. Many event studies assume that the formal announcement of the event is an adequate proxy for the date at which the market first becomes aware of the new information. Halpern (1973) provides evidence that this

is a poor assumption in the analysis of mergers. In fact, it is generally the case that the market has reacted to information of the pending merger several weeks before the formal announcement.

The determination of this first point of informational impact, time I, uses the fact that returns to the acquired firm's shareholders are known to move dramatically upward with first information of the pending merger. This phenomenon has been consistently documented in all prior research (Asquith and Kim, 1982; Mandelker, 1974; and Dodd and Ruback, 1977). Examination of geometrically accumulated excess returns for the acquired firm substantiated Halpern's earlier findings. Typically, the acquired firm's shareholders had already experienced large positive excess returns by the formal announcement date. To remove the effect of this pre-announcement increase in share prices, the point of first informational impact I, was taken to be the first point prior to the formal announcement date at which the excess returns began a consistent positive trend.

The excess returns used in this analysis were taken from the excess returns file of the Center for Research in Security Prices. Daily excess returns in the file are calculated as the difference between the actual daily return of the security and the actual daily return of a portfolio of all other listed securities in the same risk class. The risk classes are determined by grouping all listed securities by Scholes and Williams' (1977) beta which is adjusted for the effects of nonsynchronous data. These excess returns have an expected value of zero and thus their geometric accumulation also has an expected value of zero.

In examining this somewhat ad hoc determination of time I, the purpose of the exercise must be remembered. The goal of this exercise is not to find a date from which to examine returns over the merger period but rather to find a period which is representative of the normal variance of the firm's returns. When information of the pending merger begins to impact the market for the firm's stock, its value quickly moves to reflect the expected merger value of the stock. In examining the wealth shift potential of mergers, it appears much more important to analyze the return stream which is representative of the ongoing firm. Thus, the effect of the merger negotiations are deleted from the base period by using the first date of informational impact. To further ensure stability in the base period, four weeks or 20 trading days, are deducted from time I to provide a larger margin for error in estimating time I.

Data Sources

Possibly the greatest hurdle to empirical research in the area of mergers and acquisitions is the assembly of data. The problem is not that few mergers take place. In fact, there have been hundreds of mergers each quarter over the past several years. The problem is that the gathering of information about these merged firms must draw from several sources. No single comprehensive source exists. A subsidiary goal of this study has been the development of a comprehensive machine readable data base which can also be used in future research.

Table 3-1 contains a list of the variables used in this study and their sources. A detailed analysis of the merger data collected is contained in the next chapter.

Table 3-1
Data Sources

Variables	Sources
The merging firms	Mergers and Acquisitions (1968 - 1983) lists all mergers in which the value of the transaction exceeds $1 million.
Consummation date	Mergers and Acquisitions.
Formal announcement date	The Wall Street Journal Index (1967 - 1982) and the Business Periodicals Index (1967 - 1982).
Industries represented (Standardized Industrial Codes)	Daily returns file of the Center for Research in Security Prices tapes records industrial codes and effective dates.
Stock returns, market returns and prices	Daily returns and daily master files of the Center for Research in Security Prices tapes.
Excess returns	Excess returns file of the Center for Research in Security Prices tapes.
Debt ratios and other financial data	Industrial and Research Compustat tapes, corporation annual reports and 10-K reports.
Interest rates	Federal Reserve Bulletin (1966 - 1983).
Terms of merger	Mergers and Acquisitions.

CHAPTER 4
THE DATA

Introduction

The research undertaken in this study progressed through a number of phases. First, the criteria for including mergers in the sample was developed and the sample was collected. Second, the relevant event dates were identified. Determination of these dates defined the periods for which other data were collected. Third, financial and other data for the merging firms were collected. Finally, the test equations were estimated. The results of the first three steps of this process are reported in this chapter.

This chapter is organized into two sections. The first section outlines the sample selection criteria. The second section provides a detailed analysis of the characteristics of the sample and includes an analysis of the determination of the dates of informational impact and the magnitudes of the values for the synergy variable.

Sample Selection Criteria

As discussed earlier, there are hundreds of mergers each quarter. Thus, the lack of possible candidates for inclusion in the sample was not a problem. However, the majority of these mergers involve small firms for which public data is limited or unavailable. In order to obtain the needed data the sample was restricted to those mergers where both acquired and acquiring firms were traded on the New York or American Stock exchanges at the time of the merger. This

restriction corresponds to the requirement that both firms in the merger have publicly traded common stock recorded on the security price tapes of the Center for Research in Security Prices (CRSP) at the University of Chicago. Further, only those firms whose stock traded daily up to the announcement of the merger were included. Specifically, no more than two non-consecutive days without trading were allowed for any firm in the period from the beginning of the base period until the formal announcement of the merger. This restriction was necessary to eliminate those firms whose securities were too thinly traded to allow a reasonable estimate of the variance of the returns.

One of the most restrictive criteria applied to the sample was the requirement that each merger represent a unique event for each component firm. That is, only those firms which had no other mergers from the beginning of the base period until one year after the merger were included. While this requirement limited the size of the sample, it was necessary for two reasons. First, the effect of any one merger cannot be isolated in firms with multiple mergers. Secondly, Schipper and Thompson (1983) suggest that there may be fundamental differences between firms which acquire other firms as single events and those which acquire numerous firms as part of an acquisitions policy.

Two other restrictions were imposed upon the sample. First, because of the differences in the capital structures of financial and non-financial firms, only non-financial firms were included in the sample. Secondly, in order to make the time periods under study more consistent, the period under study for each merger was not allowed to

exceed three years. This restriction was imposed to eliminate mergers which took place over many years or which involved lengthy anti-trust litigations. These mergers were eliminated because the lengthy time period involved might allow too many other events to affect the test variables.

The period under study is from January 1, 1969 to December 31, 1982. The beginning date of this period corresponds with the earliest date for which financial records of merging firms were available. The ending date was chosen to be as current as possible while still allowing time for post-merger data to become available. The time period under study has a number of desirable characteristics. It is long enough to limit the possibility that the results have occurred because of a short term phenomenon. The period includes some of the most active years for mergers and some of the largest mergers in history.

Sample Characteristics

If the results of any empirical study are to be generalizable, the sample must represent a reasonable cross section of the population under study. The sample employed in this study appears to have this characteristic. The mergers under study are listed in Appendix B. This appendix contains the names of the acquiring and acquired firms and the consummation dates of the mergers. The total size of the sample is 126 firms or 63 mergers.[1] This represents a complete population of the mergers between publicly traded firms which met the sample criteria and for which data were available.

Table 4-1 contains a classification of the sample by the major industry divisions of the standard industrial code for both the acquiring and acquired firms. It can be seen that the sample represents a broad cross section of non-financial corporations.

Table 4-2 delineates the sample by the year in which the merger occurred. There is an obvious concentration of the sample in the more recent years. This has resulted from the unavailability of data for firms in the earlier periods. The greatest hurdle in carrying out this research has been the collection of data. Because of the need for data not contained in easily obtainable sources such as Compustat, individual financial statements for each firm were examined. The availability of these financial statements from the earlier years under study was severely limited.

Table 4-3 shows the sample classified by estimated market values of the component firms prior to the mergers. Table 4-4 stratifies the sample by the ratio of the value of the acquired firm to the value of the acquiring firm. As can be seen, the sample contains some of the largest publically traded firms along with some of the smallest. Further, the mergers vary from being relatively small acquisitions for the acquiring firms to acquisitions of firms larger that the acquiring firms themselves. It should be noted that a careful check of the mergers was made to determine which firm was the acquiring firm. The acquiring firm was taken to be that firm whose shareholders retained control of the merged firm. Mergers for which the acquiring firm could not be identified were deleted from the sample.

Table 4-1
Stratification of the Sample by Primary
Standard Industrial Codes (SIC)

Standard Industrial Code	Industry	Number of Acquiring Firms	Number of Acquired Firms
1000 - 1499	Mining	3	4
1500 - 1799	Construction	2	0
2000 - 2099	Food	3	2
2200 - 2399	Textiles and apparel	3	5
2400 - 2799	Wood and paper	2	3
2800 - 3099	Chemicals, petroleums and rubber	10	5
3100 - 3299	Leather, stone, glass and concrete	3	0
3300 - 3499	Primary and fabricated metals	4	6
3500 - 3699	Machinery	8	6
3700 - 3799	Transportation equipment	2	4
4000 - 4899	Transportation and communication	6	5
5000 - 5099	Wholesale trade	1	3
5300 - 5999	Retail trade	7	9
7200 - 8099	Services	3	4
	Miscellaneous	6	7
	Total	63	Total 63

Table 4-2
Stratification of the Sample by Year of Merger

Year	Number of Mergers
1969	1
1971	2
1972	3
1973	6
1974	1
1975	1
1976	6
1977	11
1978	9
1979	7
1980	11
1981	5
Total	63

Table 4-3
Stratification of the Sample by Estimated Market Value

Range of Market Value (in millions)	Number of Acquiring Firms	Number of Acquired Firms
$ 0 - $ 99	5	33
100 - 199	9	10
200 - 399	9	11
400 - 599	7	4
600 - 799	2	2
800 - 999	4	0
1000 - 1199	5	0
1200 - 1399	4	0
1400 - 1599	5	1
1600 - 1799	2	0
1800 - 1999	2	0
2000 +	9	2
	Total 63	Total 63
Mean Market Value	$1307.76	$250.93
Minimum Market Value	34.45	9.14
Maximum Market Value	11876.18	3036.93

Table 4-4
Stratification of the Sample by Relative Size of Acquisitions

Range (in percent)[1]	Number of Mergers
0 - 9.999	15
10 - 19.999	20
20 - 29.999	14
30 - 39.999	2
40 - 49.999	3
50 - 59.999	2
60 - 69.999	2
70 - 79.999	0
80 - 89.999	0
90 - 99.999	2
100 +	3
Total	63
Mean Relative Size	29.79 percent
Minimum Relative Size	1.66 percent
Maximum Relative Size	212.53 percent[2]

1. Note that relative size is measured as the ratio of the estimated market value of the acquired firm to the estimated market value of the acquiring firm. For example, if firm A, with an estimated market value of $40 million buys firm B, with an estimated value of $10 million, the relative size of the acquisition is $10.M/$40.M = .25 or 25 percent.

2. Relative size of greater than 100 percent indicated that the acquired firm was larger than the acquiring firm. Three mergers in the sample had this characteristic. In each case, further examination was made to ensure that the acquiring firm did retain control of the combined firm following the merger.

Of the 63 mergers in the sample, 31 or 49.2 percent had terms which stipulated at least partial payment in cash. The remainder were effected as pure exchange mergers involving only the exchange of shares. The mergers funded by cash were of two main types: 65 percent used only cash and 35 percent used a combination of cash and share exchanges. Some of these mergers were two step transactions with the acquiring firm obtaining control of the target firm by a cash tender offer for shares and later obtaining the balance of the outstanding equity through a share exchange. Another group of mergers which were funded partially by cash were carried out in one step, with the acquirer purchasing the acquired firm for a package of cash and securities.

As the primary goal of this study involves explaining changes in capital structure of merging firms, it is useful to examine the changes which occurred in the sample firms. Table 4-5 shows the range and distribution of the changes in leverage for the sample, using both book value and market value measures. Recall that these variables are calculated as the actual change in leverage which occurred over the adjustment period in each merger.

In an earlier study, Kim and McConnell (1977) analyzed a sample of 31 mergers using measures of leverage similar to the ones employed in this study. Table 4-6 presents comparative data from the two studies. It can be seen that both studies find similar tendencies for merging firms to increase their leverage. The Kim and McConnell study finds increases in leverage that exceed the magnitudes of similar measures used in this study. These differences can be traced to two major dissimilarities between the samples used in the two

Table 4-5
Changes in Leverage Around the Merger Dates

Range	Number of Firms Market Value Measure	Number of Firms Book Value Measure
Greater than -50%	1	0
-50% - -40%	0	0
-40% - -30%	6	0
-30% - -20%	4	1
-20% - -10%	10	9
-10% - 0	11	16
0 - 10%	7	14
10% - 20%	8	10
20% - 30%	6	7
30% - 40%	2	3
40% - 50%	0	0
Greater than 50%	8	3
	Total 63	Total 63

Mean Change in Total Market Value Measure 14%

Mean Change in Book Value Measure 7%

Table 4-6
A Comparison of Changes in Leverage with the Kim and McConnell Study

Item	Present Study	Kim and McConnell Study [1]
Sample size	63	31
Period of study	1969 - 1982	1960 - 1973
Market value leverage		
Mean change	+14%	+36%
Number increasing	35	18
Number decreasing	28	13
Book value leverage		
Mean change	+ 7%	+16%
Number increasing	37	26
Number decreasing	26	5

[1] Source: (Kim and McConnell, 1977)

studies. First, the time period of the Kim and McConnell study was 1960 to 1973 while the current study examines the period 1969 to 1982. It may be that part of the variation results from these different time periods, possibly due to differences in the relative levels of interest rates which affect the costs of debt in each period. The second major dissimilarity between the two samples is the restriction in Kim and McConnell's sample to include only mergers where the acquired firm was at least 10 percent of the size of the acquiring firm. As was discussed earlier and can be seen in Table 4-4, the sample in the current study contains several mergers with acquisitions ratios less that 10 percent. Further, there are correlation coefficients of .04 and .26 between ratio of value of acquired to acquiring firms and the market and book value measures of changes in leverage, respectively. Especially in the case of book value measures of leverage, these correlations suggest that the differences in results of the two studies occur largely because of this difference in sample selection criteria.

Determination of the Date of First Informational Impact

The primary goal of this study is to attempt to explain changes in leverage of merging firms in terms of the parameters suggested by the option pricing model as it applies to the valuation of firms. The most critical variables in this study are the variances of the two firms in each merger. If these variances are to represent the volatility of the firms in the merger independent of any combination of the two firms, the period over which the variance is measured must not include any period in which information of the pending merger has

reached the market. As was discussed in detail in chapter three, the assumption that information of a pending merger does not impact the market prior to the formal public announcement is a poor one (Halpern, 1973, pp. 565-568).

Following the methodology outlined in chapter three, the returns to the acquired firms' shareholders were analyzed. Table 4-7 contains the distribution of days prior to the formal announcement dates at which information of the pending mergers appeared to begin to affect the trading securities. Halpern (1973), using a somewhat similar methodology based on monthly, rather than daily, returns found that using a date seven month prior to the formal announcement of the merger included the majority of firms in his sample. The results of Halpern's study are generally similar to the results of this study although it appears that seven months would have been an overly large adjustment to the announcement date in this sample.

Note

1. While this sample size may appear relatively small compared to the total number of mergers over the period it is not of unusual size compared to the samples used by other researchers of mergers. For example, Kummer and Hoffmeister (1978) examined 88 mergers, Dodd's (1980) sample included 71 completed mergers and Schipper and Thompson (1980) analyzed a sample of 30 firms. The size of the sample in each of these studies is affected by the availability of a wide cross section of data. Studies, such as Mandelker (1974) and Elgers and Clark (1980), which examined much larger samples were restricted to examining fewer variables and typically looked only at returns to equity holders.

Table 4-7
The Frequency Distribution of the Number of Days Between the Formal Announcement Dates and the Dates of First Informational Impact

Number of Days	Number of Mergers
1 - 20	10
21 - 40	17
41 - 60	7
61 - 80	4
81 - 100	10
101 - 120	5
121 - 140	2
141 - 160	3
161 - 180	4
greater than 180	1
Total	63
Mean number of days	68
Minimum number of days	5
Maximum number of days	203
Range in days	198

CHAPTER 5
TEST RESULTS

Introduction

The final step in this research was the estimation and interpretation of the test equations. As outlined in chapter three, the test equations were formulated to test two central hypotheses against two alternate hypotheses. Prior to reviewing the results, it may be useful to reiterate these hypotheses.

Central Hypothesis 1: Managers act as if they are aware of the wealth shift potential of mergers and take neutralizing actions commensurate with the magnitude of the shifts.

Central Hypothesis 2: The degree of managerial response is inversely related to the magnitude of potential synergies available from the merger.

Alternate Hypothesis 1: The changes in capital structure which occur during a merger result from managers reactions to existing conditions in the financial markets at the time of the merger.

Alternate Hypothesis 2: The changes in capital structure which occur during a merger are simply a result of the terms of the merger.

Two series of tests were performed during this study. First, the test equation was estimated on the entire sample without

controlling for the effects of synergy. The results of these tests are presented in this chapter. Next, the effects of synergy were included in the analysis. The results of these tests are presented in the next chapter.

The organization of this chapter follows that of the presentation of the linear models in chapter three. These models test the first central hypothesis against the two alternate hypotheses under the assumption that managers act to maximize shareholders' wealth. No attempts are made to control for the effects of synergy. The final section of this chapter summarizes the results of the various models.

The results presented in this chapter are based upon the use of accounting data as a proxy for firm leverage in the dependent variable. Financial theory suggests that the model should be formulated with the dependent variable in market value terms. As the true market value of the firm is unobservable, some proxy must be used. However, these proxies tend to be subject to substantial estimation errors. For completeness, the tests reported in this chapter were repeated with Eger's (1983) proxy for market value. The results of these tests and a discussion of the problems with using this proxy are contained in Appendix A.

Model One

The first test equation estimated uses the most observable measure of variance, the variance of the firms equity returns. This measure of variance was shown to be the upper bound of the variance of the return on value for the total firm.

The test equation is as follows:

$$\Delta D_i = \gamma_0 + \gamma_1 \Delta V1_i^U + \gamma_2 \Delta V2_i^U + \gamma_3 \Delta M_i + \gamma_4 \Delta I_i + \gamma_5 \Delta E_i + \gamma_6 C_i + \varepsilon_i$$

Where $\gamma_0, \gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5, \gamma_6$ are the regression parameters.

ΔD_i = the change in leverage associated with merger i with leverage measured as the book value of total debt divided by the book value of total assets.

$\Delta V1_i^U$ = the change in variance associated with the acquiring firm using the upper bound measure of variance.

$\Delta V2_i^U$ = the change in variance associated with the acquired firm using the upper bound measure of variance.

ΔM_i = the change in the weighted average maturity of debt in merger i.

ΔI_i = the change in average long term interest rates from the base period to the adjustment period.

ΔE_i = the change in the average level of the stock market from the base period to the adjustment period.

C_i = the ratio of cash used in the merger to the post-merger total assets of the firm.

If the first central hypothesis is valid, one should observe negative and significant values for the coefficients of $\Delta V1_i^U$ and ΔM_i. Shastri's analysis suggests that the coefficient of $\Delta V2_i^U$ should be negative. Significant negative values for the coefficients of ΔI_i or ΔE_i would be supportive of the first alternate hypothesis and if the second alternative hypothesis is valid, one should observe a positive and significant value of the coefficient of C_i .

The results of the regression appear in Table 5-1 along with the relevant test statistics. The model appears to have reasonable explanatory power as reflected in the R-square value. It must be remembered that the model being estimated is cross-sectional. Pindyck and Rubinfeld (1981, p. 64) note that cross-sectional models tend to have low R-square values even when the models are satisfactory because of the large variation inherent in the data.

It should also be noted that, while the intercept is significant it provides very little information. There are two reasons for this conclusion. First, the intercept is a measure of the mean of the dependent variable when all independent variables are simultaneously equal to zero. However, both the interest rate and equity level variables cannot equal zero under economically rational conditions. Thus the intercept provides no information. Second, while the intercept is significantly different from zero, it is not significantly different from one, the level of the dependent variable if leverage remains constant. Therefore, the intercept does not suggest the direction of leverage changes without a change in the independent variables.

The results of this model support the central hypothesis that managers act as if they are aware of the wealth shift potential of mergers and take neutralizing actions commensurate with the shifts. Option pricing theory suggests that as the diversification effect increases, managers should increase the leverage of the firm to neutralize the increasing size of the wealth shift. This suggests that the coefficient of $\Delta V1$ should be negative and significant as was found in the model. Thus it appears that, for the firms studied, the

Table 5-1
Results of Model One

		Coefficient Value	T Statistic*	Significance**
Intercept		1.386	5.03	.000
Coefficient of:	$\Delta V1^U$	- .388	-2.18	.034
	$\Delta V2^U$	- .154	-1.89	.064
	ΔM	.065	2.22	.031
	ΔI	.088	1.19	.241
	ΔE	- .115	- .66	.513
	C	1.012	3.00	.004

F value = 7.6060

Significance = .0001

R-square = .4400

* The T-statistic is calculated under the null hypothesis that the coefficient equals zero.

** The significance level is defined as the probability of obtaining a larger absolute value of the coefficient when the coefficient is actually equal to zero.

greater the wealth shift potential of a merger, the greater the increase in leverage undertaken by managers. This is consistent with managements' maximization of shareholders wealth.

A number of other interesting items result from the estimation of this model. First, note that the coefficient of $\Delta V2$ is negative and significant. This suggests that managers are influenced not only by the diversification effects of the merger to their own shareholders but also the effects to the shareholders of the acquired firm. This result is supportive of Shastri's (1983) work which asserts that the magnitude of the total wealth shift depends upon the relative changes in variance experience by both groups of shareholders in the merger. It appears that management tends to take actions to offset all gains to debtholders, whether they result from wealth shifts from the acquiring firms shareholders or the acquired firms shareholders. This result is also consistent with a management which attempts to maximize shareholders wealth.

A second item of interest is the sign of the coefficient of ΔM, the maturity variable. The coefficient has a positive sign and is significant at the three percent level. Option pricing theory suggests that a merger which results in a decrease in the overall maturity of debt harms the shareholders unless management increases the leverage of the firm. Thus, the coefficient was expected to have a negative sign because, as the maturity of debt increases, less debt is required to neutralize any particular wealth shift. The observed result may have occurred because of the tendency of managers to increase their permanent leverage by issuing long term debt. However, the result obtained is completely consistent with wealth

maximizing goals of the managers. Option pricing theory suggests that a manager, whose goal is to maximize shareholders wealth, will issue debt of as long a maturity as possible, ceteris paribus. Thus the positive sign of the ΔM coefficient is consistent both with the option pricing framework and wealth maximization by managers.

A third item of interest is the apparent lack of influence of market factors upon changes in leverage around the time of mergers. Note that the coefficients of both the change in interest rates and the change in stock market levels were found to be insignificant. This suggests that changes in leverage which occur during mergers are not influenced by recent changes in the relative costs of debt and equity. These results suggest that the first alternative hypothesis can be rejected. There are at least two possible explanations for these results. First, managers may believe in the efficiency of financial markets and thus not believe that they can time their choices of financing to obtain lower overall costs of funds. If this scenario is correct, one would expect the coefficients to not be significant. Second, it may be that the role of interest rates and market levels are too complex to result in significance in this rather simple formulation. This study is only concerned with one issue within the broad area of merger research. It has been observed that mergers tend to occur in waves (Weston and Chung, 1983). Researchers have not reached a conclusive answer to this phenomenon but it is possible that market forces including interest and equity rates may play a role in some complex way. Thus mergers may tend to occur when certain conditions prevail in the debt or equity markets.

If so, examination of these mergers might not lead to a significant relationship being found for the variable included in the model.

A final item of interest in this first model is the importance of the terms of the merger in explaining the changes in leverage. The coefficient of C is positive and significant. This supports the second alternate hypothesis. However, remember that the central hypothesis is also supported. That is, while that magnitude of the potential wealth shift has a strong influence on managerial response, the amount of cash used in the merger also influences the degree of change in leverage. This result may be explained by reference to the expansion and no expansion cases discussed in chapter one. Recall that there are two ways for the firm to increase its leverage. The proceeds from debt may be used to retire equity without any expansion in the firm, or the firm may finance future expansion with debt until a new desired degree of leverage is obtained. A merger which is funded with cash provided by the proceeds of debt is essentially analogous to the nonexpansion case. Thus a merger which is funded by cash may allow the manager to move to a new degree of leverage much more quickly than a pure exchange merger. It may be that the result obtained in the test equation occurs because managers of the firms involved in pure exchange mergers have not had sufficient time to move their firms' leverage to the new desired level.

In summary, the results of the first model support the central hypothesis, reject the first alternate hypothesis and support the second alternate hypothesis. Managers appear to be taking actions consistent with the maximization of shareholders wealth in that they are cognizant of potential wealth shifts and act to prevent such

shifts from hurting shareholders. Also, the variables suggested by option theory appear to have strong explanatory power for changes in leverage.

Model Two

Model one was based upon the variance of the firms' equity returns which was shown to be the upper bound for the total variance of the firm. The second form of the model substitutes the lower bounds for the variance estimates. This form of the model provides an important test of the sensitivity of the model to alternate estimates of the variance variable. If the results of this model are consistent with those of the first, there is less need for concern about the true variance estimate.

The test equation is as follows:

$$\Delta D_i = \gamma_0 + \gamma_1 \Delta V1_i^L + \gamma_2 \Delta V2_i^L + \gamma_3 \Delta M_i + \gamma_4 \Delta I_i + \gamma_5 \Delta E_i + \gamma_6 C_i + \varepsilon_i$$

which is identical to the formulation of model one except $\Delta V1_i^U$ and and $\Delta V2_i^U$ are replaced with the following variables respectively.

$\Delta V1_i^L$ = the change in variance associated with the acquiring firm using the lower bound measure of variance.

$\Delta V2_i^L$ = the change in variance associated with the acquired firm using the lower bound measure of variance.

As this model differs from the preceding one only in the estimate of variance employed, the expected signs remain unchanged. The coefficients of $\Delta V1_i^L$, $\Delta V2_i^L$ and ΔM should be negative. Again, the first alternate hypothesis would be supported by negative and significant values for ΔI_i and ΔE_i and the second alternate hypothesis suggests the coefficient for C_i should be positive and

significant if the hypothesis is valid. The overall significance of the model relative to the prior estimation is difficult to specify in advance. It is possible that the lower bound estimate of variance, which takes into consideration the firms' capital structure will be a more accurate figure and improve the estimate. However, it is also possible that the inclusion of the estimated capital structure of the firm in the variance estimate will increase the error in estimation and thus reduce the significance of the model. Table 5-2 contains the results of the second model.

As can be readily observed, the structure of this formulation varies only slightly from that of model one. All variables retain the same signs and those variables without significant coefficients in the first formulation are still insignificant. The only significant change which results from this formulation is that the coefficient of $\Delta V2$ is now insignificant. One cannot determine whether this occurs because the change in variance experienced by the acquired firms' shareholders is not a determinant of the change in leverage or whether it appears insignificant simply because its true value is small but non-zero. As earlier discussed, it is possible that increased variation in the estimate results in this insignificance.

While the economic interpretation of the second model is identical to that of the first, the second formulation provides an important test of the model's sensitivity to the estimates of variance. As was discussed in chapter three, the most difficult variable to estimate is the ex ante variance of the return on value of the firm. Since the return on value of a firm is unobservable itself, the estimation of its ex ante variance is extremely difficult to determine. However, using historical returns as a predictor of future

Table 5-2
Results of Model Two

		Coefficient Value	T Statistic*	Significance**
Intercept		1.234	4.64	.000
Coefficient of:	$\Delta V1^L$	- .204	-2.46	.017
	$\Delta V2^L$	- .088	-1.17	.249
	ΔM	.073	2.54	.014
	ΔI	.079	1.08	.286
	ΔE	- .147	- .80	.425
	C	1.102	3.57	.001

F value = 7.5370

Significance = .0001

R-square = .4500

* The T-statistic is calculated under the null hypothesis that the coefficient equals zero.

** The significance level is defined as the probability of obtaining a larger absolute value of the coefficient when the coefficient is actually equal to zero.

returns, the upper and lower bounds of the variance can be estimated. Unfortunately, should these two estimates provide results which are inconsistent with each other, no conclusions can be reached. Fortunately, the results of models one and two are completely consistent with each other, which suggests that the general formulation of the model is robust to the estimate of variance employed.

In summary, the results of the second model are consistent with the central hypothesis and alternate hypothesis two. The results suggest that the first alternate hypothesis can be rejected. The results of the first and second models combined suggest that the general formulation is robust to the estimate of variance of return on firm value.

Summary of Results of Models Without Control for Synergistic Effects

The results of both formulations of the model have provided strong evidence that managers do act as if they are aware of the wealth shift potential in mergers and do take neutralizing actions to offset those shifts. Both formulations of the model support rejection of the first alternate hypothesis. The changes in capital structure occurring during mergers do not appear to be related to changes in conditions in the financial markets. Additionally, both forms of the model provide evidence that the terms of the merger impact the use of debt. This result may have occurred because of the time periods involved and the managers differing ability to change leverage quickly in expansion and nonexpansion cases.

Another important result is the apparent robustness of the model to the estimate of variance. The use of upper and lower bound

estimates of variance in the equations resulted in nearly identical structures of the resulting model. All inferences were consistent between the models. This result is an important one in itself as it suggests that the unobservable variance of the firm may be adequately proxied using upper and lower bound estimators and available data.

CHAPTER 6
THE EFFECTS OF SYNERGY

Introduction

The tests in the previous chapter were performed under the assumption that managers act to maximize shareholders' wealth and have ignored the effects of synergies. However, it has been argued that the existence of synergy may impact managerial actions. This section tests this premise. Specifically the second central hypothesis is tested:

Second central hypothesis: The degree of managerial response is inversely related to the magnitude of potential synergies available from the merger.

This hypothesis is tested in addition to the first central and alternate hypotheses. These hypotheses are retested to determine whether the model's structure varies systematically with the amount of available synergies.

The purpose of this chapter is twofold. First, the results of the tests including synergy are reported. Second, this chapter provides a comprehensive review of the existing methodology and the related problems in empirically measuring synergies. Virtually the entire merger literature is concerned with gains to merger participants and indirectly with synergies. Most reasons advanced for mergers, as discussed in chapter two, are based upon the capture

of synergies, yet few attempts have been made to quantify these gains empirically. Haugen and Langetieg (1975) attempted to measure synergy by examining changes in risk but found no evidence of synergy in their sample. Halpern (1973) used a control technique to isolate gains but was primarily concerned with the popular question of whether acquiring firms' shareholders gain in mergers.

As discussed in chapter three, there are three known ways to estimate synergistic gains. One of these is ad hoc and is based on the similarity of the lines of business of the merging firms. The other two are based upon changes in the market value of the firms' equity relative to a control group. One method uses the market model as a control while the other uses specifically matched firms to control for expected price movements not associated with the merger. In this study, both the ad hoc measure and the specific control group measure of synergy were collected. The market model based measure was not used because of its inferiority compared to the specific control firms measure. The specific control firms, which were taken to be firms in the same industry with the highest correlation of returns, should control for approximately the same market variation as the market model technique, as the control firms should have similar betas as the actual merging firms. However, these specific firms will also control for industry specific variation which is ignored by the market model.

Three measures of synergy were constructed and two techniques used to test their importance. The ad hoc measure of synergy resulted in a dummy variable which was added to the general formulation and also used to split the sample for testing the equality of

the two resulting structures. The market value technique resulted in a continuous variable which was added to the general formulation. Additionally the sample was ranked by the continuous variable and divided into two groups by the relative value of S_i. These mergers with a S_i value greater than the median were considered to be highly synergistic. Those with a S_i value less than the median were considered to have low synergy. This dummy variable formulation was compared to the ad hoc variable and also used to split the sample for testing the equality of the two resulting structures.

This chapter is divided in four sections. The first section contains the results of reestimation of the general model with the inclusion of the synergy variables. The second section contains the results of splitting the sample by the synergy variables. The third section discusses the theoretical and empirical problems which are encountered in the measurement of synergy. The final section provides a summary and conclusion.

Reestimation of the General Model

The models discussed in chapter five were estimated under the assumption that the existence of synergies does not affect the actions of managers and thus does not influence the changes in capital structures during mergers. This assumption is consistent with the models developed by Galai and Masulis (1976), and tested by Kim and McConnell (1977) and Eger (1983). However, it is possible that synergistic gains do influence managements' decisions. Specifically, it is hypothesized that managers tend to increase debt less during synergistic mergers than during non-synergistic mergers in an

attempt to capture some personal gains. To test this hypothesis and retest the other hypotheses, the following linear form of the test equation was estimated.

$$\Delta D_i = \gamma_0 + \gamma_1 \Delta V1_i + \gamma_2 \Delta V2_i + \gamma_3 \Delta M_i + \gamma_4 \Delta I_i + \gamma_5 \Delta E_i + \gamma_6 C_i + \gamma_7 S_i + \varepsilon_i$$

All variables are as previously defined. If the first central hypothesis is correct and managers are acting as if they are aware of the wealth shift potential of mergers and taking neutralizing actions, one should observe negative and significant values for the coefficients of the variance and maturity variables. If the first alternate hypothesis is correct and the changes in capital structure are simply the result of market conditions, the coefficients of the interest rates and equity market levels should be negative and significant. If the changes in capital structure are simply the result of the terms of the merger, as the second alternate hypothesis asserts, the coefficient of the cash variable should be positive and significant.

The sign of the coefficient of the synergy variable is of particular interest. The second central hypothesis suggests that the sign should be negative and significant. An insignificant value for the coefficient suggests that the assumption under which the models were initially estimated is valid. That is, an insignificant value of the coefficient implies that the magnitude of synergies do not impact managements' decision on capital structure. A positive sign for the coefficient suggests that management increases debt more in synergistic mergers. This is consistent with management goals of shareholder wealth maximization.

The models will be presented and discussed in the same order as in the previous chapter. Similar models will be grouped together to conserve space and because of the repetitiveness of many results. Additionally, the results of the models based on a market value proxy definition of leverage with the inclusion of synergy are contained in Appendix A. In the discussions, more stress will be given to the similarity in sign and magnitude of the various coefficients than to statistical significance. [1]

Models one and two were each reestimated three times with the inclusion of the variable S_i to capture the effects of synergy. The first form of S_i is continuous and is based on the change in market value measure of synergy. The two other forms include S_i as dummy variables. Except for the inclusion of this variable, the models are identical to those estimated in the earlier sections of this chapter. As discussed above, the inclusion of S_i allows the testing of the second central hypothesis along with the retesting of the other hypotheses with inclusion of synergistic effects.

The results of the two regressions are reported in Tables 6-1 and 6-2 along with the original forms of the models without synergy for comparison purposes. In both cases, the results of the models reestimated with inclusion of the synergy variable are completely consistent with the models estimated without consideration of synergy. The coefficients of the synergy variables show no consistent pattern. Three of the six are significant at the ten percent level and have positive signs but three are insignificant and two have negative signs. If synergies affect the model the effect is very small and the direction is uncertain. The results imply that

Table 6-1
Model One Reestimated with
the Inclusion of Synergistic Effects

Coefficient	With Control for Synergy			Without Control for Synergy
	Market Value Based Continuous Variable	Market Value Based Dummy Variable	Line of Business Dummy Variable	
Intercept	1.293**	1.192**	1.276**	1.386**
$\Delta V1$	- .362**	- .282	- .451**	- .388**
$\Delta V2$	- .164*	- .161*	- .165*	- .154*
ΔM	.064**	.076**	.070**	.065**
ΔI	.106	.121	.134*	.088
ΔE	- .028	- .100	- .026	- .115
C^{BV}	.905**	.883**	.678*	1.012**
S	- .037	.073*	.095*	

* Significant at the 10 percent level.

** Significant at the 5 percent level.

Table 6-2
Model Two Reestimated with
the Inclusion of Synergistic Effects

Coefficient	With Control for Synergy			Without Control for Synergy
	Market Value Based Continuous Variable	Market Value Based Dummy Variable	Line of Business Dummy Variable	
Intercept	1.201**	1.143**	1.157**	1.234**
$\Delta V1$	- .176**	- .166**	- .199**	- .204**
$\Delta V2$	- .125	- .110	- .096	- .088
ΔM	.067**	.077*	.077**	.073**
ΔI	.109	.122	.109	.079
ΔE	- .142	- .158	- .120	- .147
C^{BV}	1.116**	.981**	.864**	1.102**
S	- .006	.056	.081*	

* Significant at the 10 percent level.

** Significant at the 5 percent level.

the second central hypothesis may be rejected. Managers' actions do not appear to be influenced by the magnitude of available synergies.

It is also interesting to note that the structures of the other variables in the models are virtually unchanged. In all cases, the coefficients retain the same signs and most retain the same levels of significance. The structures of the models have not been altered by the presence of a variable which measures synergy. Thus, all forms of the models support the first central hypothesis. Managers do appear to be acting as if they are aware of the wealth shift potential of mergers and are taking actions consistent with the neutralization of these shifts. This result is unaltered by the presence of a variable which controls for synergy.

The results continue to suggest that the first alternate hypothesis may be rejected. Market factors appear to have little impact on capital structure decisions during mergers. However, as before, the terms of the merger do have an effect on the changes in capital structure. Again, one cannot determine from these models whether this result reflects a fundamental difference between pure exchange mergers and those using cash or whether the result occurs because of the ease with which managers can increase debt levels when a ready use for cash exists.

In summary, the results of the reestimation of models one and two suggest that changes in leverage which occur during mergers are not influenced by synergy. The results suggests that the second central hypothesis may be rejected.

Reestimation of the Models on Subsamples

The preceding section has provided evidence that the magnitude of synergies do not play a significant role in the determination of capital structure for merging firms. However, one must be careful not to infer too much from the results. It is possible that there are fundamental differences between synergistic and non-synergistic mergers which are not captured by a regression on a sample which includes both types.

To allow for such differences, the sample was divided into subsamples by the dummy variable forms of the synergy variable S_i. Each of the models were then estimated on each subsample and the results compared. The comparison of the models across subgroups concentrated upon testing the equality of the total models rather than individual coefficients.[2] Because of the multiple comparisons required, limited confidence can be attributed to any one comparison of coefficients.

Subsamples Based on the Market Value Measure of Synergy

Models one and two are presented together in this section for conciseness. Before presentation of the results, the purposes of reestimating the models on subsamples should be reviewed. The primary reason for this exercise is to determine whether all mergers may be analyzed together regardless of their potential for synergies. If it is found that the subsamples are sufficiently different to warrant individual estimation, the validity of the inferences made in the earlier sections must be reexamined.

Tables 6-3 and 6-4 contain the results of the regressions of models one and two respectively. Also contained in each table, for comparison purposes, are the results of the regressions using the total sample. For both models, the results from the high synergy subsample are statistically different from those of the low synergy subsample when synergy is measured using the market value based measure.

These results suggest that synergistic mergers are systematically different from non-synergistic mergers. Fortunately, the results do not suggest that the earlier findings, based on the total sample, are invalid. Note that the signs of the coefficients for the variance and maturity variables remain consistent with the prior results. This is supportive of the first central hypothesis. It appears that while managerial response may differ depending on the existence of synergies, the direction of response is unchanged. Managers appear to be acting as if they are aware of the wealth shift potential of mergers and are taking actions consistent with neutralization of the shifts.

The results are also consistent with earlier assertions about the alternate hypotheses. The coefficients of the interest rates and stock market variables continue to fluctuate without a consistent pattern and are generally insignificant. This suggests rejection of the first alternate hypothesis. Market forces appear to have little explanatory power. However, the sign and magnitude of the coefficient for the cash variable remains consistent. It appears that the terms of the merger are an important determinant of changes in capital structure.

Table 6-3
Model One Estimated on Subsamples
Based on Relative Synergy Measured by Market Value Changes

Coefficient	High Synergy Subsample	Low Synergy Subsample	Total Sample
Intercept	1.752**	.729*	1.386**
$\Delta V1^U$	- .390*	- .244	- .388**
$\Delta V2^U$	- .362**	- .202	- .154*
ΔM	.035	.210**	.065**
ΔI	.138*	- .051	.088
ΔE	- .402*	.419	- .115
C^{BV}	1.038**	1.032**	1.012**

The models estimated on the subsamples are statistically different at the one percent level.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

Table 6-4
Model Two Estimated on Subsamples
Based on Relative Synergy Measured by Market Value Changes

Coefficient	High Synergy Subsample	Low Synergy Subsample	Total Sample
Intercept	1.216**	1.140**	1.234**
$\Delta V1^L$	- .068	- .292*	- .204**
$\Delta V2^L$	- .151*	- .197	- .088
ΔM	.047*	.188**	.073**
ΔI	.137	- .043	.079
ΔE	- .261	.101	- .147
C^{BV}	.961	1.081**	1.102**

The models estimated on the subsamples are statistically different at the one percent level.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

The results are inconclusive regarding the second central hypothesis. The results of model one suggest that the diversification effect results in greater increases in debt in high synergy mergers. This can be seen by noting the larger absolute value of the coefficients of the variance variables in the higher synergy subsample. However, the results in model two are reversed. Higher synergy appears to lead to less debt. These conflicting results cannot be reconciled as the model appears to be sensitive to the estimate of variance used. It is also possible that the synergy variable which was used to partition the sample into subgroups was inadequate.

Subsamples Based on the Line of Business Measure of Synergy

Tables 6-5 and 6-6 contain the results of the regressions and, as before, the results using the total sample for comparison purposes. For both models, the results from the high synergy subsample are statistically different from those of the low synergy subsample.

In general the models appear quite similar in structure to those estimated on the subsamples created by the market value measure of synergy. However, the significance levels of the coefficients are generally lower. This may have occurred because of increased volatility of the variables within each subsample due to increased error in assigning each merger to the high or low synergy group. Thus, in general, while the results of this method of predicting synergy have resulted in statistically different subgrouping of the

Table 6-5
Model One Estimated on Subsamples
Based upon the Line of Business of the Merging Firms

Coefficient	High Synergy Subsample	Low Synergy Subsample	Total Sample
Intercept	1.058*	1.728**	1.386**
$\Delta V1^U$	- .309	- .335	- .388**
$\Delta V2^U$	- .143	- .188	- .154*
ΔM	.044	.235**	.065**
ΔI	.141	.089	.088
ΔE	.066	- .554	- .115
C^{BV}	.703	.876	1.012**

The models estimated on the subsamples are statistically different at the five percent level.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

Table 6-6
Model Two Estimated on Subsamples
Based upon the Line of Business of the Merging Firms

Coefficient	High Synergy Subsample	Low Synergy Subsample	Total Sample
Intercept	.995**	1.814**	1.234**
$\Delta V1^L$	- .150*	- .396	- .204**
$\Delta V2^L$	- .069	- .167	- .088
ΔM	.047	.225**	.073**
ΔI	.127	- .086	.079
ΔE	- .019	- .570	- .147
C^{BV}	.834*	.757	1.102**

The models estimated on the subsamples are statistically different at the five percent level.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

data, the results do not appear to be as good as those obtained with the market value based synergy variable.

However, it is interesting to note that while this synergy measure does not appear to divide the sample as clearly into subgroups, the results are now consistent with regard to the second central hypothesis. For both models, the absolute value of the two variance coefficients are larger for the low synergy subsample. This result is consistent with the second central hypothesis. Managers appear to be increasing leverage less in high synergy mergers. However, it must be noted that the differences between the coefficients tend to be small and are not statistically significant at the 10 percent level. Thus the results must be considered inconclusive.

Summary of Subsample Reestimation

Reestimation of the models on subsamples created by the two synergy dummy variables provided evidence that the structure of the models are significantly different depending upon the magnitude of available synergies. It is particularly interesting to note that while the market value based measure of synergy resulted in a more significant division of the sample, the line of business measure yielded more consistent results across the two models. There are two possible explanations for these results. First, the low significance levels suggest that the results may be spurious. Second, it is possible that the line of business measure may be more accurately reflecting synergies. As will be discussed in the next section, the change in market value measure is actually subject to error from a number of sources.

Problems in the Estimation of Synergy

When results, such as those obtained in this analysis of synergistic effects, are obtained, one must consider whether it is because there is no relationship between the variables or whether the tests are insufficient to find such a relationship. In this analysis it is probable that the measures of synergy used are insufficient to accurately proxy merger synergies. This section examines the desirable characteristics of an adequate synergy measure and the problems with existing proxies.

In this study, the goal was to examine managerial action during mergers. It was hypothesized that the magnitude of synergies would impact managerial action. Since managers may act prior to the actual realization of synergies, the proper variable to consider is the ex ante expected synergies form the merger.

Two methods were used in this study to measure this variable. The first measure, which attributes synergy to those mergers between firms in the same line of business, does have the desirable characteristic of examining synergy potential rather than achieved synergies ex post. However, this measure is very crude. It does not differentiate between highly synergistic and slightly synergistic mergers. Further, it is likely that some mergers between firms in the same industry will be non-synergistic while some between very different firms will be highly synergistic.

An alternative method of measuring synergies is based on examining the actual changes in market value of the merging firms compared to some control group. This method has the advantage of producing a continuous variable which measures the relative change in value.

However, this method also has significant problems which can be illustrated by considering the measurement process.

Consider the total combined change in market value of two merging firms (ΔMV) measured from before until after the merger. To control for changes which would have been expected to occur without the merger, changes in a control portfolio are included (ΔMV_C). This control portfolio may be constructed of either specific firms or the general market. Of course, the control portfolio will not be perfect and there will be an error associated with the control process (ε_i). The change in market value will include the expected synergy, S_i, *ex ante* and any difference between the *ex ante* synergy and the synergy realized *ex post* ($S^{EP} - S_i$). It is important to remember that managerial response during the merger will be impacted by expected synergies, not the value of synergies realized at some later date. Finally, any unneutralized wealth shift which has occurred during the merger, will also be included in the total change in market value.

Algebraically the total change in market value is

$$\Delta MV = (\Delta MV^C + \varepsilon) + S_i + (S^{EP} - S_i) + w.$$

For simplicity denote $(S^{EP} - S_i)$ as ΔS^{EP}, the difference between *ex ante* and *ex post* synergies.

Therefore

$$\Delta MV = \Delta MV^C + \varepsilon + S + \Delta S^{EP} + w$$

The estimator of synergy employed in the analysis is

$$\hat{S} = \Delta MV - \Delta MV^C,$$

where the hat denotes an estimate of the true value. This leaves the total error as follows

$$\text{Error} = S - \hat{S}$$

$$= - \Delta S^{EP} - w - \varepsilon$$

In mergers where the value of synergies are small, the error associated with the estimate may exceed the synergy itself. It has been argued that synergies may be small in general (Kitching, 1967). Thus it appears that the market value based measures of synergy may be subject to substantial error.

In summary, the existing techniques for measuring synergistic gains in mergers are poor and subject to substantial errors. This may be the cause of the inconclusive results obtained in this study.

Summary and Conclusion

In this chapter the effects of synergy on the structure of the model were examined using three synergy variables. Synergistic effects were examined both by direct introduction of the variables into the test equation and by tests of equality of the model structures when subsamples were created by relative synergy.

In general, the first central hypothesis continues to be supported. There is no consistent evidence to support the second central hypothesis. That is, these tests do not support the contention that managers are persuing personal goals in the management of capital structure during mergers. There is, however, evidence which suggests that future sectional tests should contain controls for synergistic effects. The way in which synergies are measured was also examined. The results of this examination suggest that current estimation techniques may be subject to substantial errors.

Notes

1. A researcher must be very careful when analyzing the significance levels of coefficients and models when multiple forms are estimated. As successive forms of a model are estimated, the probability of making an erroneous decision based upon t and F statistics increases. For this reason, limited importance will be attributed to the statistics of the later models. However, they will continue to be reported for reference but the reader is cautioned against attaching great significance to them.

2. To test whether the models estimated on the subsamples were significantly different from each other the following test was used (Chow, 1960).

$$F^{7}_{49} = \frac{(ESS_T - ESS_1 - ESS_2) / 7}{(ESS_1 + ESS_2) / 49}$$

Where F^{7}_{49} = an F statistic with 7 numerator degrees of freedom and 49 denominator degrees of freedom.

ESS_T = the error sum of squares from the regression on the total sample.

ESS_1, ESS_2 = the error sum of squares from the regressions on the low and high synergy subsamples respectively.

The computed F is compared with critical value of the F distribution with the same degrees of freedom. A computed F larger than the critical F is evidence that the two models are significantly different from each other.

CHAPTER 7
SUMMARY AND CONCLUSIONS

Introduction

This study was designed to examine the relationship between the potential for wealth shifts, which option pricing theory has shown should occur in corporate mergers, and the actual responses of managers. Thus, this study acts as a link between the academic theory of finance and the practice of business finance. The issue addressed in this research is of importance for two very practical reasons. First, the empirical validation of a theoretical result is important if progress in financial research is to be maintained. Second, if financial research is to be of any practical importance to managers of real firms, the actions of real managers must be considered. This study examines the real actions of managers within the framework of a financial model.

In formulating the model to test the two central hypotheses, alternate hypotheses were developed to allow for real market forces which might affect the results. In fact, one of these alternate hypotheses was found to be supported by the results along with one of the central hypotheses.

Summary of Results

The first phase of this study was the collection of data. The large amount of data required, combined with the need to ensure that each merger represented an unique event, resulted in a very

restrictive sample selection criteria. The resulting sample of 63 mergers did, however, represent a broad sample of industries and covered the time period from January 1, 1969 to December 31, 1982. Several forms of the model were estimated. First, the model was estimated using both upper and lower bound estimates of variance. Subsequently, each of these formulations was estimated with the inclusion of a variable to capture the effects of synergies and on subsamples formed according to the relative synergy of the mergers. The tests were also repeated with an alternate form of the model with leverage defined in market value terms. These results appear in Appendix A.

The first series of tests, which did not control for synergies, provided strong evidence that managers alter the leverage of their firms in a manner consistent with the neutralization of the wealth shifts suggested by financial theory. This is the most important finding of the study. No prior research has attempted to determine whether the inferences about wealth shifts in mergers suggested by financial theory are actually observable in real firms. This study provides evidence that suggests that these inferences are valid.

The study of synergistic effects yielded two major results. First, the structure of the models were found to vary significantly between those mergers with high synergy and those with low synergy. This, in itself, is an important result. This study clearly shows that future empirical research which uses cross-sectional models to examine merging firms must include some control for the effects of synergy.

The second major result deals with the second central hypothesis. The results provide no consistent evidence that managers act to benefit themselves at the expense of their shareholders. This suggests that the monitoring and bonding systems which are designed to induce managers to maximize shareholders' wealth are working. It could be argued that the result occurs simply because synergy is not properly measured. This type of criticism can never be totally refuted and the specific problems with the currently available methods for measuring synergy were discussed.

Another important result is the apparent unimportance of general market factors in explaining changes in the capital structures of merging firms. Changes in interest rates and stock market levels appear to have no impact on the changes in capital structure which occur during mergers. However, the results do suggest that the terms of the merger are important in explaining capital structure changes.

Future Research

Most studies conclude by suggesting possible avenues for continued research. This study is no different. At least four areas which require examination can be outlined.

First, much more study is needed to explore the reasons for the apparent importance of book value measures of leverage over market value measures. Financial theory suggests that market value formulations should be superior to book value based ones. However, the proxy used in this study did not perform adequately, possibly due to its inherent volatility.

Second, this study has shown that managers react to potential wealth shifts by taking neutralizing actions in their management of leverage. But do such actions benefit the shareholders? If so, such actions should be reflected in the equity returns of the firms. Are there systematic differences between the returns to shareholders whose managers have not altered the book debt ratios and those whose managers have taken such actions. This relationship could be tested by combining the analysis of this study with an analysis of shareholders returns, possibly in a simultaneous system of equations.

Third, results presented in this study suggest that current methods of measuring merger synergies are not adequate. Further research is needed to determine a method which can more accurately predict the synergistic gains in mergers.

Finally, the wealth shifts dealt with in this study are not peculiar to mergers. A firm undertaking a large capital budgeting project can experience the same diversification. The relationships examined in this study can be applied to firms undertaking large projects. This is another avenue for future research.

Conclusion

This paper has presented a series of tests which have linked the option pricing based financial theory with managerial practice. The methodology designed for this purpose was tested using a broad sample of non-financial mergers in the period from 1969 to 1982. The results generally support the central hypothesis that managers act to neutralize wealth shifts which occur during mergers and rejects the hypothesis that managers pursue personal goals when synergies are

present. The study suggests that the amount of cash used in the merger is an important determinant of changes in leverage and provides evidence that suggests future cross-sectional merger studies should allow for the effects of synergy. The study further suggests that capital structure changes of merging firms are insensitive to changes in interest rates and stock market levels.

APPENDIX A
REFORMULATION OF THE TESTS BASED ON AN ALTERNATE PROXY FOR LEVERAGE

APPENDIX A
REFORMULATION OF THE TESTS BASED ON AN ALTERNATE PROXY FOR LEVERAGE

Introduction

The test results presented in chapters five and six of this study have used leverage measures based upon accounting definitions of leverage and value. Financial theory in general and particularly option pricing theory is based upon market valuations. While market values are unobservable and subject to substantial estimating error, completeness demands that some estimation of market value leverage be tested in the model. Therefore, the following formulation is based on Eger's (1983) proxy for market value which has been shown to work adequately in her tests. The total market value of the firm is estimated to be the sum of the market value of equity and the book value of debt. This proxy yields a closer approximation to market value than do book value measures but avoids the problem of estimating the market value of debt.

This appendix is organized into two main sections. The first repeats the tests reported in Chapter five with the market value proxy. The second section repeats the analysis of synergistic effects with the market value proxy.

Reestimation of the Models Without Control for Synergy

The presentation of the models without control for synergistic effects follows the presentation of the models in Chapter five. Each

model is examined individually and the results compared with the results using book value measures of leverage.

Model One

The test equation is as follows:

$$\Delta D_i^{MV} = \gamma_0 + \gamma_1 \Delta V1_i^U + \gamma_2 \Delta V2_i^U + \gamma_3 \Delta M_i + \gamma_4 \Delta I_i + \gamma_5 \Delta E_i + \gamma_6 C_i^{MV} + \varepsilon_i$$

where the parameters and variables are defined as before except as follows:

ΔD_i^{MV} = the change in leverage associated with merger i with leverage measured as the book value of total debt divided by the sum of the book value of total debt and the market value of equity.

C_i^{MV} = the ratio of cash used in the merger to the post-merger estimated market value of the firm.

While this form of the model is formulated in market values rather than book values, the expected signs remain unchanged. The coefficients of $\Delta V1_i^U$, $\Delta V2_i^U$ and ΔM should be negative if the first central hypothesis is correct. The first alternate hypothesis would be supported by negative and significant values for ΔI_i and ΔE_i and the second alternate hypothesis would be supported by a positive and significant coefficient for C_i^{MV}. The results of this regression appear in Table A-1.

The explanatory power of this model is extremely low, as indicated both by the R-square value and the fact that only one coefficient is significant at the five percent level. The

Table A-1
Results of Model One Reestimated with Market Value Leverage

		Coefficient Value	T Statistic*	Significance**
Intercept		1.001	1.38	.172
Coefficient of:	$\Delta V1^U$	.297	.70	.484
	$\Delta V2^U$	.050	.23	.818
	ΔM	.046	.26	.536
	ΔI	.306	1.74	.088
	ΔE	- .537	-1.18	.242
	C^{MV}	.611	2.05	.045

F value = 1.9680

Significance = .0853

R-square = .1700

* The T-statistic is calculated under the null hypothesis that the coefficient equals zero.

** The significance level is defined as the probability of obtaining a larger absolute value of the coefficient when the coefficient is actually equal to zero.

coefficient of C_i^{MV} does have the expected sign and is significant. This result is supportive of the second alternative hypothesis, that observed changes in leverage of merging firms simply reflect the need for funds resulting from the terms of the merger. The only other coefficient which could be considered even marginally significant is that of ΔI. However, note that the positive sign suggests that the higher interest rates are, relative to the past, the more debt managers wish to add to their firms. This nonsensible result suggests that the significance level of ΔI is spurious.

The results of model one suggest rejection of the central hypothesis. This is a startling result considering the outcomes of the first two models. Financial theory suggests that market value measures of leverage should be better than those based on accounting book values and the option pricing model, on which this research is based, is specifically couched in market value terms. Further, the estimates of market value and leverage used in this study have been shown in other studies (Kim and McConnell, 1977; and Eger, 1983) to be good proxies for the unobservable variables. Why has this result occurred? The explanation for this result appears to be that the volatility of the market value measures of leverage increase the errors of the estimate.

Table A-2 contains comparative statistics for the two leverage measures.

Table A-2
A Comparison of the Leverage Measures

Statistic	ΔD (Book Value)	ΔD (Market Value)
Mean	1.073	1.140
Standard Deviation	.204	.434
Range	1.170	2.477
Correlation Coefficient	.193	

The most notable dissimilarity between the two variables is the wide difference in standard deviations. This characteristic is also reflected in the ranges of the two variables. The market value definition of leverage is much more volatile. This result is to be expected because of the introduction of stock market volatility into the measurement of value. This increase in variance of the dependent variable can be expected to increase the standard error of the estimate. However, the model should remain consistent. Thus this change, alone, does not explain the complete reversal of signs.

However, further examination of the measurement process reveals a related problem. Because of the inherent volatility of the market value measure, the timing of the pre-merger and post-merger measurement dates becomes crucial. Since subsequent movements in the level of the stock market may mask managements desired changes in leverage, it is crucial that both the pre and post-merger measurement points be reflective of managements actual perceptions of the firms desired capital structure. There is no practical way of insuring this date is properly determined. This problem is substantially less important

when using accounting data because the values are not subject to random volatility from outside forces such as the stock market.

Model Two

The prior model used the upper bound estimate of variance. As with the book value based models, the lower bound estimate of variance is now introduced into the model to test the sensitivity of the market value formulation to the estimator of variance used.

The test equation is as follows:

$$\Delta D_i^{MV} = \gamma_0 + \gamma_1 \Delta V1_i^L + \gamma_2 \Delta V2_i^L + \gamma_3 \Delta M_i + \gamma_4 \Delta I_i + \gamma_5 \Delta E_i + \gamma_6 C_i^{MV} + \varepsilon_i$$

where all variables and parameters are as previously defined.

This formulation of the model differs from the prior one only in the estimate of variance used. The expected signs of all variables are identical to earlier models. However, this model provides a useful test of the sensitivity of the model to the estimate of variance employed.

The results of the regression appear in Table A-3 and are generally consistent with those of the prior model. Again the only variable which is highly significant is C_i^{MV}. This result supports the second alternate hypothesis. The coefficient of ΔV_i^L is marginally significant but has the wrong sign. This suggests the significance may be spurious. Note that the coefficient of ΔI_i, which was marginally significant in the prior model now is highly insignificant. This supports the earlier contention that its significance in model three was spurious.

Table A-3
Results of Model Two Reestimated with Market Value Leverage

		Coefficient Value	T Statistic*	Significance**
Intercept		1.102	1.17	.094
Coefficient of:	$\Delta V1^L$	.385	1.89	.063
	$\Delta V2^L$	.302	1.63	.109
	ΔM	.013	.18	.859
	ΔI	.175	.97	.334
	ΔE	- .728	-1.64	.107
	C^{MV}	1.989	2.85	.006

F value = 3.0470

Significance = .0119

R-square = .2500

* The T-statistic is calculated under the null hypothesis that the coefficient equals zero.

** The significance level is defined as the probability of obtaining a larger absolute value of the coefficient when the coefficient is actually equal to zero.

Summary of Results

The results obtained with the use of the market value proxy were very poor. This suggests that the approximation of market value employed is insufficient to detect actual managerial responses to wealth shifts. The apparent reason for this result is that the size of the management induced leverage changes is small compared to the changes in market value leverage which occur randomly due to stock market volatility.

It could be argued that the results are consistent with management's reference to book value leverage over the more accurate market value leverage measures. The results are consistent with this hypothesis but are far from conclusive. As presented, one cannot determine whether the result is obtained because of this startling possibility or simply because the market value based proxy for leverage is insufficient for its intended purpose.

Reestimation of the Models With Control for Synergy

The presentation of the models based on the market value proxy with inclusion of a control for synergy follow the same format as in Chapter six. Models one and two with leverage defined using the market value proxy as before, were reestimated with three forms of the synergy variable included. Except for the addition of these variables, the models remain identical to those estimated earlier in the appendix. Additionally, the stability of the model across subsamples by relative synergy was tested.

Tables A-4 and A-5 presents the results of the regressions along with the original forms of the model, estimated without control for

Table A-4
Model One Reestimated with the Inclusion of Synergistic Effects and Market Value Leverage

Coefficient	With Control for Synergy			Without Control for Synergy
	Market Value Based Continuous Variable	Market Value Based Dummy Variable	Line of Business Dummy Variable	
Intercept	1.156	1.304	1.078	1.001
$\Delta V1$	.780	.643	.672	.297
$\Delta V2$	.100	.091	.105	.050
ΔM	.000	- .011	.014	.046
ΔI	.151	.134	.160	.306*
ΔE	- .998*	- .870*	- .805*	.537
C^{MV}	2.485**	2.381**	1.999**	.611**
S	.074	- .082	.079	

* Significant at the 10 percent level.

** Significant at the 5 percent level.

Table A-5
Model Two Reestimated with the Inclusion of Synergistic Effects and Market Value Leverage

Coefficient	With Control for Synergy			Without Control for Synergy
	Market Value Based Continuous Variable	Market Value Based Dummy Variable	Line of Business Dummy Variable	
Intercept	1.238*	1.296*	.968	1.102*
ΔV1	.324	.316	.397*	.385*
ΔV2	.231	.218	.304	.302
ΔM	.005	- .006	.020	.013
ΔI	.187	.171	.201	.175
ΔE	- .757	- .734	- .669	- .728
C^{MV}	1.938**	2.069**	1.697**	1.989**
S	.010	- .063	.123	

* Significant at the 10 percent level.

** Significant at the 5 percent level.

synergy, for comparative purposes. In the estimation of market value based forms of the model without synergy, the results were disappointing. The models had almost no explanatory power and few significant coefficients. The addition of the synergy variable does not improve the estimates. In all forms of model one and two, the coefficients of the synergy variable are insignificant. The only variable which is highly significant is C^{MV} which reflects the amount of cash used in the merger. In the reestimated model one, the ΔE variable is significant at the 10 percent level. However, little confidence can be placed in this significance level because of the multiple estimations of the model.

In general, the results of these models suggest that the second central hypothesis may be rejected. This result is consistent with the results of the main tests reported in Chapter six. However, the market value forms of the models suggest that the first central hypothesis may also be rejected. This is not consistent with the results reported in Chapters five and six. Again, this result appears to have occurred because of the inherent volatility of the market value measures of capital structure which increases the standard error of estimate and makes the timing of the measurements much more crucial.

The results of the regressions on the subsamples for models based on market value definitions of leverage are contained in Tables A-6 through A-9. For all models, there are no significant differences statistically between the regressions on the high synergy subsample and the low synergy subsample. While there does appear to be several coefficients which vary widely between the two subgroups,

Table A-6
Model One with Market Value Leverage Estimated on
Subsamples Based on Relative Synergy by Line of Business

Coefficient	High Synergy Subsample	Low Synergy Subsample	Total Sample
Intercept	.593	5.816**	1.001
$\Delta V1^U$	.911*	-2.378	.297
$\Delta V2^U$	.125	.259	.050
ΔM	.006	- .398	.046
ΔI	.136	.597	.306*
ΔE	- .558	-2.585**	.537
C^{MV}	2.667**	- .831	.611**

The models estimated on the subsamples are not statistically different at the ten percent level.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

Table A-7
Model Two with Market Value Leverage Estimated on
Subsamples Based on Relative Synergy by Line of Business

Coefficient	High Synergy Subsample	Low Synergy Subsample	Total Sample
Intercept	.522	4.229*	1.102*
$\Delta V1^L$	.430*	- .767	.385*
$\Delta V2^L$	.405*	.135	.302
ΔM	.022	- .169	.013
ΔI	.136	.304	.175
ΔE	- .315	-2.342*	- .728
C^{MV}	3.320**	.289	1.989**

This model did show slight significance at the 10 percent level. The model was still rejected because of the apparent randomness of the coefficients. Note that eight pairs of regressions were tested for equality. Assuming a binomial distribution, there is a 57 percent probability of at least one test showing significance at the 10 percent level when no relationship exists. For this reason, the results were rejected as spurious.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

Table A-8
Model One Estimated on Subsamples
Based on Relative Synergy Measured by Market Value Changes

Coefficient	High Synergy Subsample	Low Synergy Subsample	Total Sample
Intercept	1.913	.659	1.001
$\Delta V1^U$	1.233	- .135	.297
$\Delta V2^U$	.122	- .389	.050
ΔM	- .002	- .027	.046
ΔI	- .009	- .262	.306*
ΔE	-1.751*	.828	.537
C^{MV}	2.518**	2.797**	.611**

The models estimated on the subsamples are not statistically different at the ten percent level.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

Table A-9
Model Two Estimated on Subsamples
Based on Relative Synergy Measured by Market Value Changes

Coefficient	High Synergy Subsample	Low Synergy Subsample	Total Sample
Intercept	2.854**	.955	1.102*
$\Delta V1^L$	.861**	- .179	.385*
$\Delta V2^L$	.269	- .276	.302
ΔM	- .023	- .061	.013
ΔI	- .161	- .151	.175
ΔE	-2.267**	.463	- .728
C^{MV}	3.656*	2.713**	1.989**

The models estimated on the subsamples are not statistically different at the ten percent level.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

the overall equality of the two regressions cannot be rejected at the 10 percent level. Examination of the data suggests that the high volatility of the dependent variable, which is defined in market value terms, results in a very low confidence level for the estimates. This is the same problem which appeared during the initial estimation of the equations discussed earlier in the chapter. This result means that no further inference about the validity of the hypotheses may be made based on these estimates.

Summary of Results

In general, the results of the tests using market value formulations provide no evidence that the magnitude of available synergies impact managerial response during mergers. The coefficients of the synergy variables were insignificant in all forms of the model and the structure of the model did not change when estimated on subsamples of high and low relative synergy mergers.

Conclusion

The results presented in this appendix strongly suggest that the proxy used to estimate market value is inadequate. The explanatory power of all forms of the model is low. The cause of this phenomenon appears to be the inherent volatility of the market value proxy caused by the inclusion of the variation of the stock market. The nominal change in leverage due to managerial response is small compared to the changes in the leverage ratio due to random changes in equity values. Thus, the proxy does not allow isolation of the capital structure change due to managerial action.

APPENDIX B
MERGERS INCLUDED IN SAMPLE

MERGING FIRMS

Acquiring Firm	Acquired Firm	Date
North American Rockwell	Miehle Goss Dexter Inc	9/12/69
Schering Corp	Plough Inc	1/16/71
Squibb Beachnut Inc	Lanvin Charles of the Ritz Inc	4/30/71
Allegheney Airlines Inc	Mohawk Airlines Inc	4/12/72
Delta Airlines Inc	Northeast Airlines Inc	8/01/72
Colgate-Palmolive Co	Kendall Co	8/16/72
Spring Mills Inc	Seabrook Foods Inc	3/03/73
Chesebrough-Ponds Inc	Health Tex Inc	5/17/73
Cypress Mines Corp	Bagdad Copper Corp	6/08/73
Jack Eckerd Corp	Ward Cut Rate Drug Co	8/08/73
Carnation Co	Herff Jones Co	8/20/73
G D Searle and Co	Will Ross Inc	12/31/73
Interco Inc	Devon Apparel Inc	1/14/74
Timken Co	Latrobe Steel Co	4/25/75
Parker Pen Co	Manpower Inc	3/01/76
Interlake Inc	Arwood Corp	4/30/76
Allied Supermarket Inc	Great Scott Supermarket Inc	6/14/76
Mobil Corp	Marcor Inc	6/30/76
American Can Corp	U S Reduction Co	6/30/76
General Electric Co	Utah International Inc	12/20/76
Jack Eckerd Corp	Eckerd Drugs Inc	1/06/77
Champion International Corp	Hoerner Waldorf Corp	3/01/77
I C Industries Inc	Stanray Corp	4/26/77

Colt Industries Inc	Menasco Manufacturing Co	5/23/77
Louisianna Land and Exploration Co	Copper Range Co	5/24/77
General Signal Corp	Sola Basic Industries	6/22/77
Norton Simon Inc	Avis Inc	6/29/77
Norris Industries Inc	McIntosh Corp	6/30/77
Union Oil Corp of California	Molycorp Inc	7/29/77
Pepsi Co Inc	Pizza Hut Inc	11/07/77
Ex-Cell-O Corp	McCord Corp	12/31/77
Essex Chemical Corp	Racon Inc	1/26/78
Humana Inc	American Medicorp Inc	1/30/78
Filmways Inc	Union Fidelity Corp	2/03/78
Bristol-Myers Co	Unitex Corp	3/31/78
General Cable Corp	Automation Industries Inc	4/12/78
C B S Inc	Gabriel Industries Inc	8/14/78
Hecks Inc	Felsway Corp	9/30/78
Dart Industries	P R Mallory and Co Inc	11/29/78
John Manville Corp	Olin Kraft Inc	12/01/78
R J Reynolds Industries Inc	Del Monte Corp	2/01/79
Jonathan Logan Inc	Venice Industries Inc	5/31/79
Brockway Glass Inc	Standard Container Corp	6/12/79
Mattel Inc	Western Publishing Inc	6/13/79
Southern Pacific Co	Ticor Inc	7/27/79
Anthony Industries Inc	Shakespeare Co	8/27/79
Levi Strauss and Co	Koracorp Industries Inc	9/10/79
Arrow Electronic Inc	Cramer Electronics Inc	1/07/80

Pan American World Airways Inc	National Airlines Inc	1/07/80
A R A Services Inc	Smith's Transfer Corp	1/28/80
Cyclops Corp	Silo Inc	2/26/80
Viacom International Inc	Sonderling Broadcasting Corp	3/25/80
Rexham Corp	Schiller Industries Inc	8/13/80
Federal Modul Corp	Huck Manufacturing Co	9/08/80
Jewel Co Inc	Sav-On Drugs Inc	11/06/80
Storage Technology Corp	Documation Inc	11/26/80
Mapco Inc	Earth Resources Inc	12/15/80
Telecom Corp	Spector Industries Inc	12/31/80
Signal Co Inc	Ampex Corp	1/15/81
Freeport Minerals Inc	McMoren Oil and Gas Co	4/07/81
Fluor Corp	St. Joe Minerals Inc	8/03/81
Allied Stores Inc	Garfinkle, Brooks Brothers, Millers and Rhoads Inc	9/17/81
Service Corp International	IFS Industries Inc	12/11/81

APPENDIX C

CONTROL FIRMS

CONTROL FIRMS

Sample Firm	Control Firm	Standard Industrial Code
Allegheney Airlines Inc	Ozark Airlines Inc	4511
Allied Stores Inc	J.C. Penney Inc	5311
Allied Supermarket Inc	Food Fair Inc	5411
American Can Corp	National Can Corp	3411
American Medicorp Inc	American Medical International Inc	8062
Ampex Corp	Applied Magnetics Corp	3662
Anthony Industries Inc	Kenai Corp	1799
A R A Services Inc	Macke Co	5962
Arrow Electronics Inc	Marshall Industries Inc	3362
Automation Industries Inc	Stanley Aviation Corp	3728
Avis Inc	C L C American Inc	7512
Bagdad Copper Corp	Campbell Reserves Inc	1021
Brookway Glass Inc	Kerr Glass Manufacturing Inc	3221
Bristol-Myers Co	Nestle Le Mur Co	2844
C B S Inc	American Broadcasting Companies Inc	4832
Carnation Co	Oscar Mayer and Co Inc	2013
Champion International Inc	Industrial Plywood Co	2435
Cheesebrough-Ponds Inc	Abbott Labs Inc	2834
Colgate-Palmolive Co	Procter and Gamble Co	2841
Colt Industries Inc	Cummins Engine Inc	3519
Copper Range Co	Valley Industries Inc	3362

Cramer Electronics Inc	Astrex Inc	5065
Cyclops Inc	Hoffman Industries Inc	3317
Cypress Mines Corp	Cleveland Cliffs Iron Co	1011
Dart Industries	Warner Lambert Co	3079
Del Monte Corp	J M Smucker Co	2653
Delta Airlines Inc	Eastern Airlines Inc	4511
Devon Apparel Inc	Marlene Industries Corp	2339
Documation Inc	Computervision Corp	3573
Earth Resources Inc	Holly Corp	2911
Jack Eckerd Corp (1973)	D S Revco Inc	5912
Jack Eckerd Corp (1977)	American Stores Co	5912
Eckerd Drugs Inc	Wal Mart Stores Inc	3362
Essex Chemical Corp	Great Lakes Chemical Corp	2819
Ex-Cell-O Corp	Lodge and Shipley Co	3541
Federal Modul Corp	New Hampshire Ball Bearing Corp	3562
Felsway Corp	Morse Shoe Inc	5661
Filmways Inc	Columbia Pictures Inc	7813
Fluor Corp	Myers Industries Corp	1629
Freeport Minerals Inc	Gulf Resources and Chemical Corp	1477
Gabriel Industries Inc	Milton Bradley Co	3944
Garfinkle, Brooks Brothers, Millers and Rhoads Inc	Gap Stores Inc	5631
General Cable Corp	Triangle Industries Inc	3357
General Electric Co	Sunbeam Corp	3634
General Signal Corp	Riley Co	3622
Great Scott Supermarket Inc	Safeway Stores	5411
Health Tex Inc	Rosenau Brothers Inc	2361

Hecks Inc	Mammoth Mart Inc	5311
Herff Jones Co	Insilco Corp	3914
Hoerner Waldorf Corp	Connelly Containers Inc	2653
Huck Manufacturing Co	Hi Shear Corp	3452
Humana Inc	Hospital Corp of America	8062
I C Industries Inc	Richmond Corp	6711
I F S Industries Inc	No control firm	7261
Interco Inc	Brown Group Inc	3143
Interlake Inc	United States Steel Corp	3312
Jewel Co Inc	Albertsons Inc	5411
Jonathan Logan Inc	Bobbie Brooks Inc	2335
Kendall Co	West Point Pepperell Inc	2211
Koracorp Industries Inc	Bobbie Brooks Inc	2335
Lanvin Charles of the Ritz Inc	Revlon Inc	2844
Latrobe Steel Co	Northwestern Steel and Wire Co	3312
Levi Strauss and Co	Blue Bell Inc	2328
Louisianna Land and Exploration Co	Basic Corp	1311
Mallory, P R and Co	Damon Corp	3679
Manpower Inc	Olsten Corp	7362
Manville, John Corp	G A F Corp	3292
Mapco Inc	Laclede Gas Co	4925
Marcor Inc	Alexanders Inc	5311
Mattel Inc	Hasbro Industries Inc	3944
McCord Corp	Arvin Industries Inc	3714
McIntosh Corp	General Housewares Corp	3469
McMoren Oil and Gas Co	Sedco Inc	1381

Menasco Manufacturing Co	Tektronix Inc	3728
Miehle Goss Dexter Inc	Harris Corp	3555
Mobil Corp	Conoco Inc	2911
Mohawk Airlines Inc	Continental Airlines Inc	4511
Molycorp Inc	Publicker Industries Inc	2869
National Airlines Inc	Braniff International Corp	4511
Norris Industries Inc	Magic Chef Inc	3631
North American Rockwell Inc	Kelsey Hayes Co	4511
Norton Simon Inc	Castle and Cooke Inc	2033
Olin Kraft Inc	Simkins Industries Inc	2651
Pan American World Airways Inc	Eastern Airlines Inc	4511
Parker Pen Co	A T Cross Co	3951
Pepsi Co Inc	Dr Pepper Co	2086
Pizza Hut Inc	McDonalds Corp	5812
Plough Inc	Forest Labs Inc	2834
Racon Inc	Gulf and Western Industries Inc	5014
Reynolds, R J Industries Inc	Philip Morris Inc	2435
Rexham Corp	A P Parts Corp	2650
Sav-On Drugs Inc	Cunningham Drug Stores Inc	5912
Schering Corp	Pfizer Co	2834
Schiller Industries Inc	Mohawk Data Sciences Corp	3573
Seabrook Foods Inc	H J Heinz Co	2030
Searle, G D and Co	Lily Eli and Co	2834
Service Corp International Co	No control firm	7261
Shakespeare Co	Coleco Industries Inc	3949

Signal Co Inc	Executive Industries Inc	3711
Silo Inc	J C Penney Inc	5311
Smith's Transfer Corp	Carolina Freight Corp	4213
Sola Basic Industries Inc	John Fluke Manufacturing Inc	3612
Sonderling Broadcasting Corp	American Broadcasting Companies Inc	4832
Southern Pacific Co	Western Pacific Railroad Co	4011
Spring Mills Inc	Burlington Industries Inc	2211
Spector Industries Inc	Overnight Transmission Co	6711
Squibb Beachnut Inc	Warner Lambert Co	2834
St. Joe Minerals Inc	Cominco Inc	1031
Standard Container Corp	National Can Corp	3411
Stanray Corp	Pullman Inc	3743
Storage Technology Corp	Amdahl Corp	3573
Telecom Corp	Cooper Jarrett Inc	4231
Ticor Inc	United Gty Corp	6361
Timken Co	Hoover Universal Inc	3562
U S Reduction Co	Union Carbide Corp	2819
Union Fidelity Corp	Republic Financial Services Inc	6321
Union Oil Corp of California	Exxon Corp	2911
Unitex Corp	Stearnco Industries Inc	3843
Utah International Inc	U N C Reserves Inc	1094
Venice Industries Inc	House Ronnie Inc	2335
Viacom International Inc	Communications Sattelite Corp	4899
Ward Cut Rate Drug Co	White Cross Stores Inc	5912
Western Publishing Inc	MacMillan Inc	3944
Will Ross Inc	Doric Corp	5086

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BIOGRAPHICAL SKETCH

Jack Trifts, the son of Albert G. and Gertrude M. Trifts, was born in New Brunswick, Canada, on October 2, 1956. He received a bachelor's degree in business administration from the University of New Brunswick in 1979 and a Master of Business Administration degree from Dalhousie University in Halifax, Nova Scotia, in 1981. The requirements for the degree of Doctor of Philosophy (finance) were completed during the fall of 1984 at the University of Florida.

Mr. Trifts and his wife Janet currently reside in Columbia, South Carolina, where Mr. Trifts is a member of the faculty of the University of South Carolina.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Richard Pettway, Chairman
Professor of Finance, Insurance and Real Estate

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Arnold Heggestad
Professor of Finance, Insurance and Real Estate

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the Graduate Faculty of the Department of Finance, Insurance and Real Estate in the College of Business Administration and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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